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Clinical indicators: a comprehensive review of the literature

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- Indicators

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- *Embase from 1980*
- *CINAHL from 1982*

Criteria applied
- Phrase

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CONTENTS

1. INTRODUCTION

The Centre for Clinical Governance Research (CCGR) was asked by Statewide Quality Branch in March 2009 to identify, review and synthesise evidence on a range of topics intended to support the *Understanding clinical practice toolkit*. This review is a comprehensive analysis of the literature on clinical indicators. Following reviews address issues of: peer review; morbidity and mortality; case review; limited adverse occurrence screening; clinical audit and complaints.

The review uses the protocol for the rapid assessment, conceptualization, and timely concise analysis of the literature [PRACTICAL],[1] developed by the CCGR. PRACTICAL emerged from CCGR's research in the fields of clinical governance, patient safety, interprofessionalism and accreditation amongst other areas.

In this review we present the results of a comprehensive review of the literature on *clinical indicators.* The literature was identified using a combination of data searching, hand searching of journals and snowball technique. At the end of the review we provide abstracts and citations, arranged alphabetically by author, for the articles identified using the outlined search strategy.

2. BACKGROUND

Clinical indicators (CIs) are a form of performance measurement, a method for assessing the quality of care by examining the incidence of specific events or incidents. Although similar performance measures had been utilised in health care since the 1980s, the call for CIs intensified in the aftermath of major public inquiries into patient safety.[1 2]

Clinical indicators can be part of, or linked to, broader health, quality, safety or performance indicators. As well as indicators associated with specific conditions such as infection, health services are increasingly including companion sets of service indicators and measures including clinical governance,[3] patient safety,[4 5] quality of life,[6 7] and health.[8] The difference between CIs and broader indicators is that CIs are said to be more suitable for internal quality improvement, while performance indicators are appropriate for external appraisals,[9] although there is substantial cross over between domains in practice.[10]

Data on clinical indicators have been developed, and the results compared, at international, national, regional, health systems, health services, discipline and individual clinician levels.[11 12] Healthcare institutions may be utilising CIs at any or all of these levels at any given time.[11 12] At an international level clinical indicators have been developed by the Organisation for Economic Co-Operation and Development (OECD), Commonwealth Fund (US), Nordic

[1] Jeffrey Braithwaite had the idea of labelling the Centre's mode for reviewing literature 'PRACTICAL'. This monograph was written by Joanne Travaglia, Jeffrey Braithwaite and Deborah Debono

Council of Ministers, World Health Organization, World Health Organization Office for Europe and the European Community.[11] [13] At a national level, the Australian Commission on Safety and Quality in Health Care, in conjunction with the Australian Institute for Health and Welfare, is said to be ready to release *National Indicators of Safety and Quality in Health Care*[14] in second half of 2009, while the Australian Council on Healthcare standards (ACHS) has been producing CIs as part of its accreditation process since 1993.[15]

2.1 Definition of clinical indicators

The Australian Council on Healthcare Standards (ACHS) provides a comprehensive definition of clinical indicators. CIs are

> *"… simply a measure of the clinical management and/or outcome of care. A well-designed indicator should 'screen', 'flag' or 'draw attention' to a specific clinical issue. Usually rate based, indicators identify the rate of occurrence of an event. Indicators do not provide definitive answers; rather they are designed to indicate potential problems that might need addressing, usually demonstrated by statistical outliers or variations within data results. They are used to assess, compare and determine the potential to improve care. Indicators are therefore, tools to assist in assessing whether or not a standard in patient care is being met."*[16]

Mainz's definition (2003) is very similar, including the proviso that because quality in multidimensional, indicators cannot be understood as direct measure of quality. In Mainz's conceptualisation, clinical indicators are:

> *"... the measure the extent to which set targets are achieved. They are expressed as numbers, rates, or averages that can provide a basis for clinicians, organizations, and planners aiming to achieve improvement in care and the processes by which patient care is provided. They can be measures of structure, process, and outcome, either as generic measures relevant for all diseases, or disease-specific measures that describe the quality of patient care related to a specific diagnosis."* [17]

The United Kingdom's (UK) National Health Service defines indicators more simply, that is, as *"… succinct measures that aim to describe as much about a system as possible in as few points as possible. Indicators help us understand a system, compare it and improve it."* [18] At a similar level, clinical indicators have been described as *"… a measure of the clinical management and/or outcome of care".*[19] The Scottish NHS makes the point that clinical indicators can be used to *"… compare variations in how the same services are provided in different areas or against national benchmarks."*[20]

3. METHOD

3.1 Overview of method and research question

We undertook a search of terms associated with clinical indicators using several databases, hand searches of key journals, using the snowball method, and via a search of the grey literature on websites associated with clinical indicators. The original list of search terms used in this review is presented in Table 1.

Table 1: List of proxy search terms for clinical audit

Search terms
1. clinical
2. indicator$

3.2 Review process

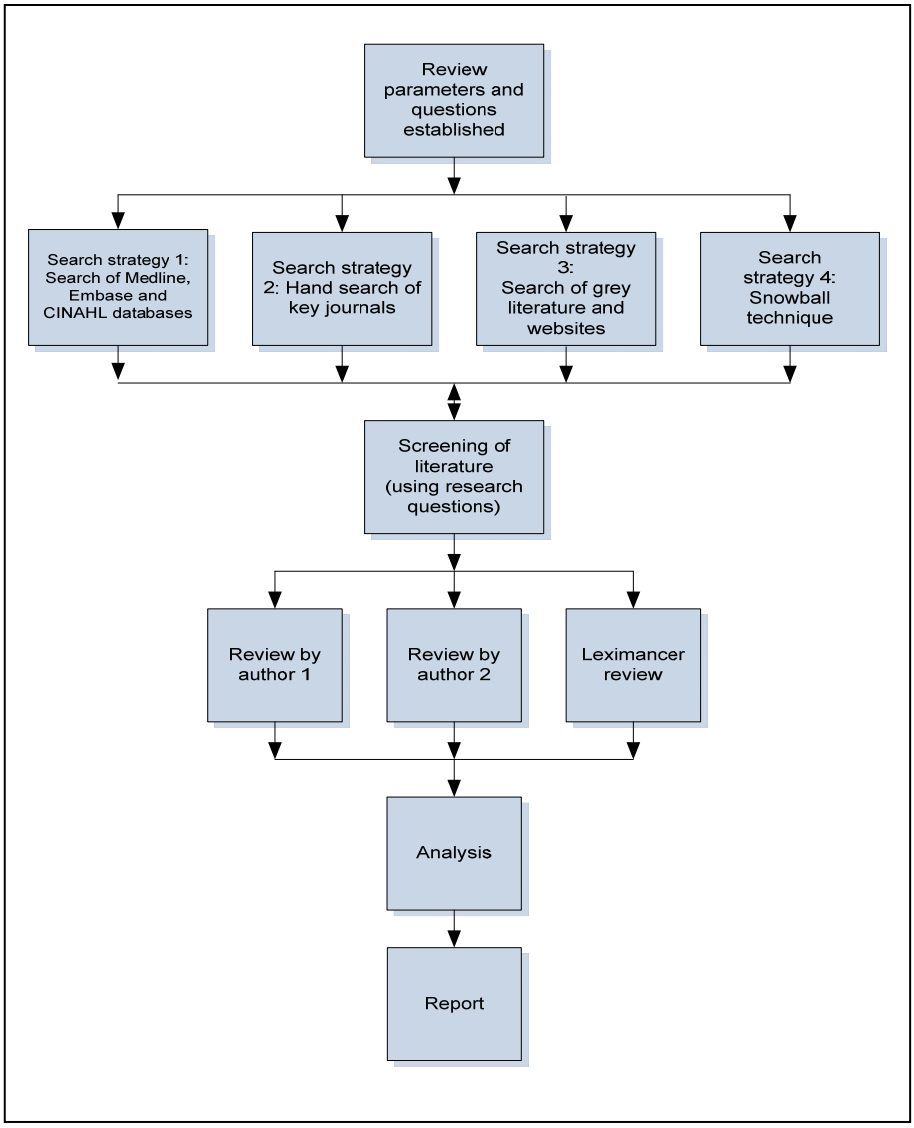
We utilised a five phase review process, as outlined in Figure 1. Phase one involved establishing the review parameters, as required by Statewide Quality Branch. The search was limited to clinical indicators and was to consider instruments as well as evidence for the effectiveness of the tool.

Phase two was the search itself, which involved identifying literature and resources associated with clinical indicators from four different, but overlapping sources: databases; key journals; grey literature; and through snowball technique and citation tracking.

Phase three was screening of the literature. This involved removing any extraneous, inappropriate or incomplete references. As this is a targeted review, only directly relevant references were included.

Phase four was the review of the literature. Research articles were noted, as were articles which provided examples of clinical indicator tools or instruments. The remaining articles were examined by two reviewers, and then the abstracts subjected to data-mining in order to identify the key concepts. Phases five and six were the analysis of findings, and the writing of this report.

Figure 1: Review process



3.3 Search strategies

3.3.1 Search of databases

The first level of our search strategy was to use the terms indicated in Table 1 to interrogate three databases: Medline, EMBASE (medicine) and CINAHL (nursing and allied health). In the first analysis limited our results to references those relating to human subjects, and those pertaining to physicians (using the variety of terms indicated above).

3.3.2 Hand search of journals

We then hand-searched key journals for similar terms relating to clinical indicators. The journals searched included:

- Quality and Safety in Health Care;
- International Journal of Quality in Health Care;

- Journal of Evaluation of Clinical Practice;
- Academic Medicine; and
- American Journal of Medical Quality.

3.3.3 Search of grey literature

Our third strategy was to examine the grey literature. This proved particularly useful in the identification of existing clinical indicators. Amongst the websites reviewed were:

- Department of Human Services (Victoria)
- Departments of Health in each state and capital Territory in Australia
- Agency for Healthcare Research and Quality (United States)
- National Health Service (United Kingdom)
- Australian Council on Healthcare Standards (ACHS)
- Australian Commission on Safety and Quality in Health Care (ACSQHC)
- Agency for Healthcare Quality and Research Quality (AHQR)
- Rand Health
- Commonwealth Fund

3.3.4 Snowball technique and citation tracking

Our final strategy was to "snowball" that is, to follow up on any additionally, previously un-identified references in the bibliographies or reference list of articles reviewed, or as listed on websites.

3.4 Search findings

We present our search findings in Table 2. These include all findings from our database searches up to, and including, the removal of duplicates. Once the references were identified they were downloaded into Endnote X2, a citation manager.

Table 2: Search findings for selected databases

	Medline May 2009	Medline in process & other non-indexed citations May, 2009	EMBASE May 2009	CINAHL 1981 – 2009 (Includes pre-CINAHL)	Total
1. Clinical indicator$	1428	45	1287	1752	4512

	Medline May 2009	Medline in process & other non-indexed citations May, 2009	EMBASE May 2009	CINAHL 1981 – 2009 (Includes pre-CINAHL)	Total
2. Total					3469

Although the literature utilising clinical and other forms of literature was large, the literature on the development and use of CIs was relatively small in comparison. As with the monograph on peer review, a substantial amount of information for this monograph was drawn from the gray literature and the websites of relevant organisations, such as the OECD and the ACHS. In addition to the information obtained via the data base searches, an additional 24 references were identified through the snowball method and or website searches.

3.5 Analysis

3.5.1 Triangulated reviewer analysis

Once the preliminary screening and review was completed, thematic content analysis of the citations was undertaken. As the data was analysed, examples of studies relating to or utilising indicators were extracted and are presented separately in Appendix D.

Two independent reviewers were used to analyse the evidence and our findings were blinded from each until completed. At that point, a discussion of the similarities or differences of categorisation of the literature was undertaken until agreement was reached. This step, along with the data mining of the literature, reduces the amount of subjective bias in the analysis of evidence.

3.5.2 Concept analysis

The citations and abstracts relating to clinical indicators were mined using Leximancer, a computerised content analysis tool. A conceptual map which summarises the key concepts in the literature, and a ranked list of concepts from emerging from the citations are produced in the next section of this document.

4. FINDINGS AND DISCUSSION

4.1 Overview of concepts emerging from the clinical indicators literature

The concept map of clinical indicators is presented in Figure 2. The key themes in the literature are: *disease, diagnosis, group, blood, cells, patients, study, care* and *indicators*. The themes speaks to the two inter-related bodies of literature, that is, the types of illness or disease used as clinical indicators (left hand side of the concept map), and the use of clinical indicators as a performance measure and as a quality and safety (right hand side of the map) improvement strategy and tool.

Figure 2: Concept map of key concepts relating to clinical indicators

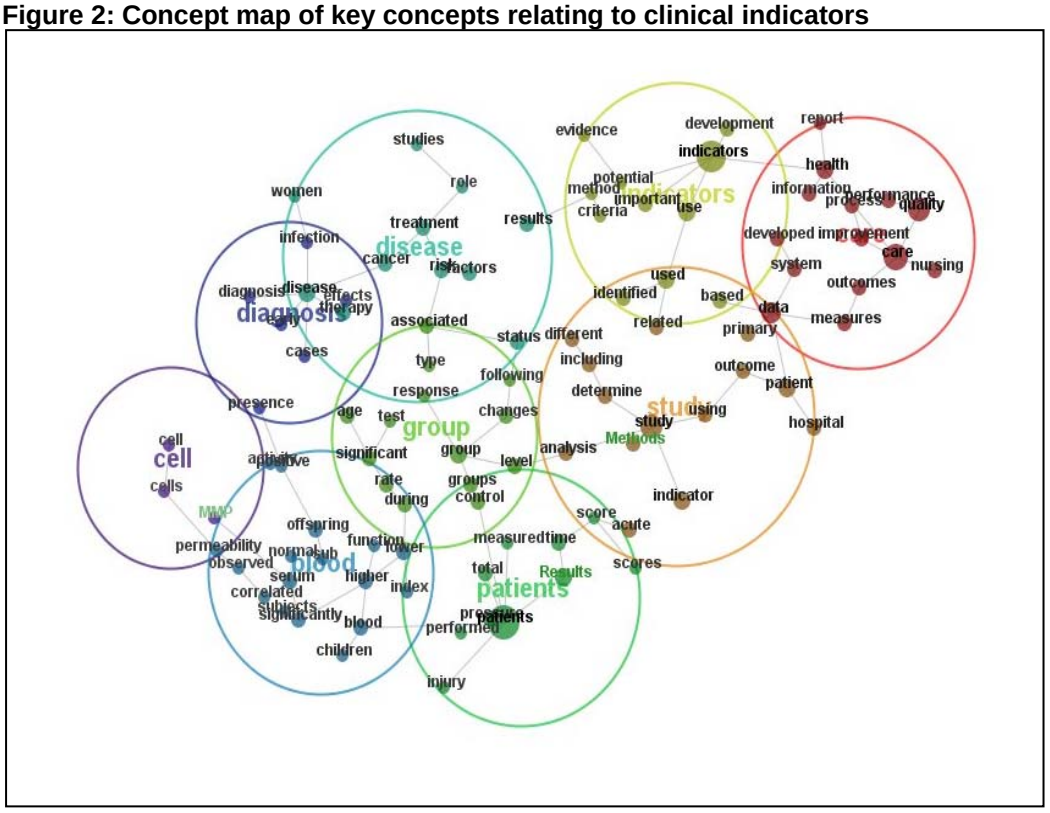


Table 3 below provides a ranked list of these concepts. The list provides insights into the relationships of concepts with each other, and the overall importance of concepts in the literature. The list shows more clearly the dispersal of key concepts in the body of the literature. *Indicators, patients, care quality* and *improvement* speak to the purpose of clinical indictors and concepts including *rate, measures, controls, studies* and *scores* indicate the process. A selection of the citations and abstracts that were interrogated for this analysis are provided (see Appendix D).

Table 3: Ranked map of key concepts relating to clinical indicators

Concepts	Count	Relevance
indicators	3538	100%
patients	3520	99%
care	2435	69%
quality	1980	56%
study	1678	47%
data	1327	38%
health	1220	34%
used	1030	29%
disease	1027	29%
indicator	1022	29%
patient	1015	29%
use	917	26%
treatment	829	23%
measures	797	23%
associated	753	21%
results	751	21%
performance	745	21%
risk	741	21%
hospital	731	21%
using	726	21%
outcomes	709	20%
outcome	694	20%
significant	671	19%
group	666	19%
analysis	639	18%
nursing	627	18%
improvement	605	17%
age	603	17%
time	596	17%
factors	566	16%
acute	561	16%
blood	545	15%
cancer	536	15%
status	530	15%
identified	524	15%
level	522	15%
determine	501	14%
pressure	500	14%
based	490	14%
important	483	14%
during	478	14%
higher	471	13%

Concepts	Count	Relevance
groups	466	13%
related	466	13%
control	463	13%
children	462	13%
process	454	13%
system	448	13%
women	444	13%
rate	438	12%
studies	435	12%
therapy	433	12%
primary	431	12%
total	419	12%
developed	411	12%
different	407	12%
diagnosis	407	12%
information	402	11%
infection	395	11%
cases	394	11%
development	390	11%
evidence	382	11%
serum	369	10%
scores	369	10%
including	366	10%
criteria	365	10%
changes	363	10%
potential	360	10%
significantly	358	10%
measured	346	10%
score	344	10%
lower	341	10%
response	335	09%
offspring	333	09%
presence	329	09%
function	328	09%
type	324	09%
positive	321	09%
test	319	09%
early	314	09%
performed	306	09%
report	301	09%
method	293	08%
permeability	282	08%

Concepts	Count	Relevance
injury	282	08%
following	277	08%
correlated	262	07%
index	258	07%
subjects	252	07%
effects	247	07%
role	244	07%
cell	230	07%
sub	220	06%
activity	219	06%
normal	216	06%
observed	204	06%
cells	138	04%

4.2 Thematic analysis of clinical indicator literature

Once we had reviewed the findings from the data mining of the literature, and had undertaken our preliminary review of citations, we established four key organising themes. These are presented in Table 4, below.

Table 4: Categories identified in the literature on clinical indicators

Category
Purpose of CIs
Development and use of CIs
Types of CIs
Public reporting of CI data

4.2.1 The purpose of clinical indicators

The need for clinical indicators emerged out of widespread concern about the quality and safety of care in health services across the world. As Mattke et al (2006) argue "*The increased interest in measuring and reporting the quality of care has heightened efforts to develop quality indicators that can assess quality performance at multiple levels of the health care system, such as care provided by individual physicians or physician groups, hospitals, health plans, regions, and even countries*."[11: 1] CIs can be used for multiple purposes depending on the user (managers, clinicians, regulators, patients)[21] including to: document the quality of care; benchmark, that is make comparisons over time and between services; make judgements about services; set service or system priorities; organise care; support accountability, regulation, and accreditation; support quality improvement; and support patient choice of providers."[17 21-24]

4.2.2 Development and use of CIs

CIs are generally evidence based, and or determined by expert panels of professionals based on their experience, often utilising a Delphi method.[9 17 25-31 32]A summary of the development (steps I to VI) and application of CIs (steps VII and VIII) is presented in Table 5, below. Appendix C and the abstracts at the end of the monograph (Appendix D) provide examples of how each of these steps are used in the development of a range of CIs.

Table 5: Steps in the development and application of clinical indicators[9 21]

Steps in the development and application of clinical indicators
I. Selection of relevant patient group, care process or clinical area to evaluate
Criteria: 1. Experience with care problems (variation, suboptimal care, lack of safety, complaints, costs, long waiting and process times) 2. Importance to the purpose of the department, care institution, or scientific association; or of political or moral importance 3. High volume 4. Enough evidence available 5. Feasibility 6. Identify opportunities for clinical intervention
II. Organize a balanced consensus group/measurement team
1. Select group participants 2. Organize and divide tasks
III. Literature search for indicators already developed or data about optimal care available (preferably recent evidence based guidelines)
1. Present documentation and knowledge from the scientific literature for potential indicators 2. Establish consensus about existing knowledge and practice
IV. Select clinical indicators and standards
1. Specification. Extraction of concrete recommendations from evidence-based guidelines 2. Prioritising. Selection by an expert panel on the basis of relevance for health benefit, efficiency, measurability and improvability a. Select process indicators b. Select outcome indicators c. Identify prognostic factors (risk adjustment) d. Establish consensus and rating procedures
V. Definition of measure specification
1. Define indicators and standards 2. Identify target population 3. Determine inclusion and exclusion criteria 4. Identify confounding factors - risk adjustment strategy 5. Establish consensus and rating procedures
VI. Operationalisation

Steps in the development and application of clinical indicators
1. Identify data sources 2. Develop unambiguous data collection procedures executable by well instructed data collectors 3. Develop an implementation plan 4. Practice test. Test of measurability and intra- and inter-reviewer reliability 5. Validate the properties of the indicators 6. Adjust indicator characteristics and recommend validated indicators
VII. Report
1. Statistics, tabulations, and data presentation 2. Correction for case mix and socio-demographic variables 3. Clear explanations of the results
VIII. Application to the system of quality improvement
1. Feedback with self, external, or standard comparisons 2. Analysis and discussion of clinical indicators with a low score 3. Analysis of obstructing and conducive factors for providing optimal care 4. Formulation of improvement and implementation strategy and carrying out of the project plan 5. Monitoring of indicators as measurements of effect and for maintenance of improvement 6. Process analysis (was the improvement process carried out as agreed?)

4.2.3 Types of CIs

As discussed previously, CIs are often used in conjunction with other, broader indicators, including patient safety and clinical governance indicators.[3] The most common indicators include measures of one or more of the following indicated in Table 6, below.

Table 6: Types of clinical indicators[3 17 21 33-40]

Type of clinical indicator	Description
Rate-based indicators	Measures of excessively poor performance, calculated as proportions or rates (proportions within a given time period), ratios, or mean values for a sample population.
Structural indicators	Measures of the attributes of settings within which healthcare occurs, including material and human resources and organisational structure.
Process indicators	Measures of the quality of the care provided, including any element in the interaction with patients, such as diagnosis and treatment. The aim is to measure whether clinicians are adhering to (evidence based) practices which achieve the best outcome for patients.
Outcome indicators	Measures or approximations of the effects of care on the health status of patients and populations. As multiple factors contribute to health care outcomes, evaluations of outcome indicators take into account differences in case mix and controls over other covariates.

Type of clinical indicator	Description
Generic indicators	Measures of aspects of care relevant to most patients.
Disease specific indicators	Measures of specific aspects of care related to predetermined diseases.
Type of care indicators	Measures of the quality and safety of different types of care including preventive, acute, chronic care.
Indicators of function	Measures of the quality and safety of healthcare functions including screening, diagnosis, treatment and or follow up.
Modality indicators	Measures of modalities including history taking, physical examination, laboratory/radiology study, the provision of medications etc.
Professional indicators	Measures of the quality of professional practice, such as nursing, mental health, nutrition, medicine etc.
Patient safety indicators	Measures of the safety of procedures or care provided to patients.
Clinical governance indicators	Measures of the safety and quality procedures implemented and enacted by healthcare services.
Culturally specific/culturally sensitive indicators	Measures of the safety and quality of care which take into account the ethnicity of patients or clients.

The scope and level of CIs differs between sponsoring agencies. The Agency for Healthcare Quality and Research, for example, has four modules for measuring quality: prevention, inpatient, patient safety and paediatric, and each of these include a series of quality indicators.[41] The OECD's HCQI in comparison include nine indicators for diabetes, 12 for mental health, 17 for cardiac care, 21 for patient safety and 27 for primary care and prevention.[42]

A sample of international and national organisations responsible for CIs is presented in Appendix B. This Appendix shows the major sets of CIs

in use across Australia, including the proposed *National indicators of safety and quality in health care*, which have not as yet been released.[14] There are two broad sets of CIs in operation at an Australia wide level, in addition to the ACSQHC's indicators, ACHS' CIs, which are applied as part of its accreditation process[14 16] and Australian Patient Safety Indicators (AusPSIs)[43] developed by Statewide Quality Branch.

While the most numerous forms of CIs are those addressing specific diseases such as diabetes,[44 45] CIs have been used to assess the quality and accuracy of health care provided in such areas as the ineffective airway clearance in children with congenital heart disease,[46] multiresistant organisms,[47] and the diagnosis of borderline personality disorder.[48] Indeed, it is difficult to find an area of healthcare which was not subject to specific or general CIs, although as some studies have noted not all disciplines (for example laboratory science)

have CIs which can be used for benchmarking performance between services.[49] Specific CIs are available in fields including (amongst many others): screening and preventative health care;[50 52] treatment of conditions, including chronic conditions,[25 51] mental health,[52] and respiratory illnesses;[53] for specific groups including children,[54] women[55] and the elderly;[56] the provision of acute care including infections[57] and surgery.[58]

4.2.4 Public reporting of CI data

The public availability of CI data has been debated extensively in the literature.[1] Arguments for the release of data to the public include that it increases accountability of healthcare services[59] and enables patients and their families or carers to make informed choices about their care.[60] One of the issues in the use of CIs to report performance is the derivation of CIs from various measurement systems. As a result of this methodological difference, reports on the same issue (for example infection rates) will not necessarily provide the same ranked order of health services or clinicians. Information released to the public (clinicians, politicians) is said to need to be balanced with education about the factors which can influence and confounded reported rates, including contextual factors such as case mix.[61 62 63] Another issue is question of which level of CI data should be released: system wide, service, or individual clinician?[64]

4.3 Evidence base for clinical indicators

The breadth and scope of clinical indicators, as well as their sheer number makes it difficult to generalise about their evidence base as a whole. As the next section in this monograph will show, many of the limitations of CIs are similar to those of all audit and review tools: the ability to define and quantify what is meant by quality of care, or optimal patient outcome; the availability of evidence upon which to develop the indicators; the robustness and validity of the instruments used; the accuracy of clinical codes; the training and inter-rater reliability of the reviewers; the provision of feedback to clinicians; and the integration of the findings into quality improvement strategies.[9 12 20 37 60 65 66 33]

Evaluations of individual sets of CIs have demonstrated robustness across different service locations[67] and patient ethnic groups;[68] and their ability to improve the quality,[69] and safety of care,[70] and facilitate change in clinician behaviours and systems of care.[31] Appendix C provides details of studies showing evidence for the value of individual sets of CIs including the AHQR's Patient Safety Indicators.[69]

4.4 Limitations of clinical indicators

Indicators are assessed on the basis of the strength of scientific evidence for their ability to predict outcomes. Mainz (2003) provided a list of the key

characteristics of an 'ideal' indicator which should be:

- based on agreed definitions, and described exhaustively and exclusively
- highly or optimally specific and sensitive, i.e. it detects few false positives and false negatives
- valid and reliable
- able to discriminate well
- able to relate to clearly identifiable events for the user (e.g. if meant for clinical providers, it is relevant to clinical practice)
- permit useful comparisons; and
- evidence-based.[17]

As well as meeting these criteria, Wollersheim et al (2007) present a clear summation of the requirements of a clinical indicator. CIs they argue should:

- give an indication of the quality of the patient care delivered
- comply with high quality standards
- be constructed in a careful and transparent manner
- be relevant to the important aspects of quality of care
- measure the quality in a valid and reliable manner with little inter- and intra-observer variability so that they are suitable for comparisons between professionals, practices, and institutions
- be selected from research data with consideration for optimal patient care (preferably an evidence-based guideline), supplemented by expert opinion
- be relevant (to important aspects including effectiveness, safety and efficiency) and dimensions (professional, organisational and patient oriented) measures of quality of care
- be feasible (that is, be appropriate, measurable and improvable) as well as valid and reliable
- be defined exactly and expressed as a quotient.[9]

Once the CI is implemented, the results should be presented in such a way as to account for their causal and contributing factors, including descriptions of the clinical context, socio-demographic variables of patients, and case mix. Finally the authors argues CIs *"… must be part of an improvement strategy, for which comparison feedback is often used"* and must therefore be sensitive to improvements over time and useful for the decision making process.[9] In other

words, the indicator must be able to trigger action if the *"… desired attribute of care falls below the standard or an undesired attribute of care rises above this level."* [21: i7] The National Health Service, Scotland identified two additional challenges to the development and use of indicators. These are producing indicators that are technically robust and interpretable; and embedding indicators in systems that lead to this information being used to improve patient care.[20]

The size and number of CIs along with other quality reporting system provides another challenge to health services. Pham et al (2006) examined the impact of quality reporting on hospitals' data collection and review processes, feedback and accountability mechanisms, quality improvement activities, and resource allocation. They found that hospitals participated in multiple and varied reporting programs, each of which had distinct effects on hospital operations. While some of these effects were positive (such as encouraging quality improvement strategies) they required sizable resources and were poorly coordinated.[71]

In addressing challenges and other limitations to the collection of data on the quality and safety of healthcare, such as voluntary reporting of errors, patient safety agencies and healthcare services have developed indicators which could be used to conduct "*… inexpensive, population-wide surveillance of quality of care, based on routinely available data source*[s] *such as administrative data."* [43] The Statewide Quality Branch's contribution to development of the Australian Patient Safety Indicators (AusPSIs) is an example of such data set. The full set of AusPSIs is presented in Appendix B3.[43] Improvements to the validity and reliability of indicators have also been linked to multidisciplinary development teams,[33 72] cultural appropriateness,[35] the involvement of patients[73]

5. CONCLUSION

Clinical indicators are a generally reliable and useful method for assessing and benchmarking the quality and safety of health care at multiple levels, across nations, states, healthcare systems and services, and in relation to specific diseases and conditions. Variations in the validity, reliability and feasibility of CIs depend on the rigour of their development, the source data to which they are applied, and the skills of the reviewers applying the CIs. While the publication of CI data to the general public is encouraged, some provisos are required, largely because of the potential for use of differences in data sources for the same measure.

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Appendix A: Evidence sheet

Topic area	Clinical indicators
Definition:	Clinical indicators are a way of assessing the quality and safety of care, against specific process, structural and outcome measures.
Origin:	Clinical and performance indicators have been in use by health services since the 1980s. An increased awareness of quality and safety issues, coupled with accreditation and regulation requirements in recent years has seen the expansion and development of clinical indicators for specific disease and service types, as well as to overarching areas such as clinical governance and patient safety.
Description:	Clinical indicators are measures of the process, structure and or outcomes of patient care. They are used by health systems and services, as well as accreditation and regulatory bodies, to identify areas of concern or development. Clinical indicators work by flagging rates of occurrences which are either under or over the expected levels.
Evidence base:	There is abundant research into the validity, reliability, feasibility and usefulness both of specific and generic sets of clinical indicators. Variations depend on the quality of the indicator, the data on which it is applied, and the skills of the reviewer.
Current use:	Clinical indicators are widely used in all Australian healthcare systems, as a way of collecting and comparing data on safety and quality across systems, and identifying areas for improvement clinician, service and system levels. Peak bodies such as ACHS and the ACQSHC either have, or are developing, national indicators on a range of issues. In addition to these broad indicators, individual CIs have been developed for specific diseases, conditions, professions and quality improvement processes. In Australia, as in the rest of the world, elements of this data are currently being released to the public through reporting of sentinel events and other types of errors.
Applications for clinical practice improvement:	Clinical indicators provide insights into both generic and highly specific indicators of best practice. They afford healthcare systems with the opportunity to benchmark the quality and safety of the care they provide to their clients over time, and in relation to comparable services.

Appendix B: Examples of national and international CIs

A sample of International and National bodies collecting and or publishing clinical indicator data

Organisation	Description	Type(s) of indicators	Publications
Australian Council on Healthcare Standards[16]	In 2007, the ACHS has collected and analysed data for 360 clinical indicators, from 689 healthcare organisations (HCOs) who participated in the ACHS Clinical Indicator (CI) program. This program reported to be is the largest source of data gathered on the quality of health care in Australia and New Zealand.	• Adverse Drug Reactions Anaesthesia Indicators • Day Surgery Indicators • Dermatology Indicators • Emergency Medicine Indicators • Gastrointestinal Endoscopy Indicators • Gynaecology Indicators • Hospital in the Home Indicators • Hospital-Wide Clinical Indicators • Infection Control Indicators • Intensive Care Indicators • Internal Medicine Indicators • Mental Health Community Indicators • Mental Health Inpatient Indicators • Obstetrics Indicators • Ophthalmology Indicators • Oral Health Indictors • Paediatric Indicators – General and ICU • Pathology Indicators • Radiation Oncology Indicators • Radiology Indicators • Rehabilitation Medicine Indicators Surgical Indicators	Australasian Clinical Indicator Report: 2001 - 2007 *Determining the Potential to Improve, 9th Edition*
Agency for Healthcare Research and Quality (AHRQ)[41]	The Agency for Healthcare Research and Quality is the leading US agency charged with responsibility for improving the quality, safety, efficiency, and effectiveness of health care. AHRQ publishes a number of reports on the quality and The AHRQ Quality Indicators (QIs) are measures of	• Prevention Quality Indicators which indentify quality of care for various ambulatory-sensitive conditions • Inpatient Quality Indicators which provide a perspective on hospital quality of care • Patient Safety Indicators which help identify potential adverse events during hospitalisation • Paediatic Quality Indicators which screen for problems that paediatric patients experience	*National Healthcare Quality Report* 2008 *National Healthcare Disparities Report*

Organisation	Description	Type(s) of indicators	Publications
	health care quality that utilise readily available hospital inpatient administrative data.		
Australian Commission on Safety and Quality in Healthcare [14]	The Australian Commission on Safety and Quality in Healthcare in conjunction with the Australian Health and Welfare Institute is in the process of developing a new series of national indicators of safety and quality in health care. These are expected to be released in the second half of 2009.	National indicators of safety and quality in health care	*National indicators of safety and quality in health care* (forthcoming)
Canadian Institute for Health Information (CIHI)[74]	The Institute publishes annual health indicators data on the health of Canadians and the quality of their health system.	**Health Conditions** • Dialysis • Organ Donations/Transplants • Injuries • Pregnancy and Childbirth **Health Services** • Ambulatory Care • Mental Health • Continuing Care • Joint replacements • Rehabilitation • Home Care • Hospitalizations • Medical Imaging **Health Human Resources** • Nurses • Physicians **Health Spending/Health** • Costs • Drugs **Health Indicators**	*Hospital standardized mortality ratio (HSMR)* reports *Health Care in Canada* 2008 *Surgical Volume Trends, 2009 - Within and Beyond Wait Time Priority Areas*
New Zealand Ministry of Health[75]	The New Zealand Ministry for Health collects and disseminates data on key adverse event and health indicators across NZ	• Unplanned admission before index admission • Unplanned readmission after • discharge from index admission • Hospital incurred patient injury	*Adverse Events in New Zealand Public Hospitals: Principal Findings from a National Survey* (2001) *The Health of New Zealand: Total*

Organisation	Description	Type(s) of indicators	Publications
		• Adverse drug reaction Unplanned transfer from general care to intensive care • Unplanned transfer to another acute care hospital Unplanned return to the • operating theatre • Unplanned removal, injury or repair of organ during surgery • Other patient complications . Development of neurological • deficit not present on admission • Unexpected death • Inappropriate discharge to home • Cardiac/respiratory arrest, low Apgar score • Injury related to abortion • or delivery • Hospital-acquired infection/sepsis Dissatisfaction with care • documented in medical record • Documentation or correspondence • indicating litigation • Any other undesirable outcomes not covered above	*Population* (2004) *Summary of Reportable events in the Officer of the Director General of Mental Health Annual Report 2007 Serious and Sentinel Events Reported By District Health Boards - 2007/08 Quality Improvement Committee first report to the Minister of Health February 2007 to June 2008 National Quality Improvement Programme: Report to Ministry of Health Annual Report October 2008*
Organization for Economic Co-operation and Development (OECD)[42]	The OECD Health Care Quality Indicator Project (HCQI Project) was established in 2001 to track the quality of health care through a set of clinical indicators based on comparable data. The Project's remit is to review, test and report on data for a set of specially developed of patient safety indicators that can	• Breast cancer survival • Mammography screening • Cervical cancer survival • Cervical cancer screening • Colorectal cancer survival • Incidence of vaccine preventable diseases • Coverage for basic vaccination • Asthma mortality rate • AMI 30-day case fatality rate • Stroke 30-day case fatality rate • Waiting time for femur fracture surgery • Influenza vaccination for adults over 65 • Smoking rates	*Health Care Quality Indicators Project Initial Indicators Report* (2006) *Health Care Quality Indicators Project Conceptual Framework Paper* (2006) *Health Care Quality Indicators 2006 Project: Data Collection Update Report* (2007) *Selecting Indicators for Patient Safety at the Health Systems Level in OECD Countries*, OECD Health Technical

Organisation	Description	Type(s) of indicators	Publications
	be reliably reported across OECD member countries which include: • Australia • Austria • Canada • Czech Republic • Denmark • Finland • France • Germany • Iceland • Ireland • Italy • Japan • Mexico • Netherlands • New Zealand • Norway • Portugal • Slovak Republic • Spain • Sweden • Switzerland • United Kingdom • United States		Paper No. 18 (2004) *Facilitating Cross-National Comparisons for Patient Safety at the Health System Level in the OECD Countries*, OECD Health Technical Paper No. 19 (2008) Drosler, S.E., N.S. Klazinga, et al. (2009) Application of patient safety indicators internationally: a pilot study among seven countries. *International Journal for Quality in Health Care* 2009.
Quality Health New Zealand[76]	Is the major Standards and Performance Assessment Agency for Health and Disability Services.	There are 20 sets of indicators, with between two and twelve indicators in each set. The indicators have been developed in conjunction with the medical colleges, most of which are combined Australian/New Zealand Colleges. There are sets for • adverse drug reactions • anaesthetics • day surgery/endoscopy • dermatology • emergency medicine • hospital in the home • hospital-wide medical • infection control • intensive care • internal medicine • mental health • obstetrics and gynaecology • ophthalmology and	

Organisation	Description	Type(s) of indicators	Publications
		excimer laser • oral health • paediatric • pathology • radiation oncology • radiology • rehabilitation medicine • surgical	
RAND Health	RAND Health has developed and tested the QA Tools system, a comprehensive, clinically based system for assessing quality of care for children and adults.	The QA Tools system contains indicators for : • general medical conditions • oncology and HIV • cardiopulmonary conditions • children and adolescent health care • women's health	*Quality of Care for General Medical Conditions: A Review of the Literature and Quality Indicators* — 2000 *Quality of Care for Oncologic Conditions and HIV: A Review of the Literature and Quality Indicators* — 2000 *Quality of Care for Cardiopulmonary Conditions: A Review of the Literature and Quality Indicators* — 2000 *Quality of Care for Children and Adolescents: A Review of Selected Clinical Conditions and Quality Indicators* — 2000 *Quality of Care for Women: A Review of Selected Clinical Conditions and Quality Indicators* — 2000
United Kingdom National Patient Safety Agency (NPSA)[77]	The National Patient Safety Agency is a Special Health Authority	Produces quarterly data summary on incidences including separate data for acute, ambulance and mental health services	*National Reporting and Learning Service* *National Clinical Assessment Service* *National Research Ethics Service* *Information on health care incidents and improving patient safety is published by the National Reporting and Learning Service*

Appendix B2: Welsh NHS Clinical Governance Indicators

Welsh NHS Clinical Governance Indicators[3]
Strategic Capacity
• Describe your three main priorities for developing clinical governance over the next three years and explain how the board intends to monitor progress. • Describe the development plans for the components of clinical governance in your organisation and how they fit together.
Consultation and Patient Involvement
• Provide three examples of consultation with patients/the public at a planning level. • Give three examples of ways in which staff are encouraged to engage in patient involvement.
Clinical Risk Management
• Give three examples of improvements identified and implemented as a result of the WRP assessment for the previous year
Clinical Audit
• Give five examples of multi-disciplinary clinical audit that has improved quality of care in your organisation. • How are clinical audit priorities set?
Research and Effectiveness
• Give a minimum of three examples of how the outcome of research and effectiveness has improved the quality of care in the organisation. • What is the % of staff trained in core skills of evidence based practice (e.g. accessing the evidence, appraising the evidence, putting evidence in to practice, evaluating through audit the outcome).
Staff and Staff Management
• How is your HR strategy linked to the organisation's quality improvement programme? • What is the average monthly percentage of locum or bank based staff.
Education Training and CPD
• What percentage of staff for each discipline have CPD plans? • What percentage of staff for each discipline have appraisals?
Use of Information
• Outline 3 key priorities for improving clinical information over the next 12 months. • What clinical information is routinely received at Board level and what use is made of it?

Appendix B3: Australian Patient Safety Indicators[43]

Australian Patient Safety Indicators
1. Complications of anaesthesia (AusPSI 1)
2. Death in low-mortality DRGs (AusPSI 2)
3. Decubitus ulcer (AusPSI 3)
4. Failure to rescue (FTR) – General (AusPSI 4) a) FTR-Acute renal failure (AusPSI 4.1) b) FTR-DVT/PE (AusPSI 4.2) c) FTR-Pneumonia (AusPSI 4.3) d) FTR-Sepsis (AusPSI 4.4) e) FTR-Shock or cardiac arrest (AusPSI 4.5) f) FTR-GI haemorrhage/acute ulcer (AusPSI 4.6)
5. Foreign body left during procedure (AusPSI 5)
6. Iatrogenic pneumothorax (AusPSI 6)
7. Infection due to medical care (AusPSI 7) – ON HOLD
8. In-hospital fracture (AusPSI 8)
9. Postoperative haemorrhage or haematoma (AusPSI 9)
10. Postoperative Physiologic or Metabolic Derangement (AusPSI 10) – ON HOLD
11. Postoperative respiratory failure (AusPSI 11)
12. Postoperative DVT/PE (AusPSI 12)
13. Postoperative sepsis (AusPSI 13)
14. Postoperative abdominal wall wound dehiscence (AusPSI 14)
15. Accidental puncture or laceration (AusPSI 15)
16. Transfusion reaction (AusPSI 16) – ON HOLD
17. Birth trauma – injury to neonate (AusPSI 17)
18. Obstetric trauma – Vaginal delivery with instrument (AusPSI 18)
19. Obstetric trauma – Vaginal delivery without instrument (AusPSI 19)
20. Obstetric trauma – Vaginal delivery (AusPSI 21)
21. Obstetric trauma – Caesarean delivery (AusPSI 20)

Appendix C: Evidence for CIs

Table 6: Evidence for CIs

Author	Purpose	Design and method	Outcome measures and results	Conclusion
Collopy et al (2000)[40]	*In 1997 a set of 53 clinical indicators developed by the Royal Australian College of Surgeons (RACS) and the Australian Council on Healthcare Standards (ACHS) Care Evaluation Programme (CEP), was introduced into the ACHS Evaluation and Quality Improvement Programme (EQuIP). The clinical indicators covered 20 different conditions or procedures for eight specialty groups and were designed to act as flags to possible problems in surgical care.*	*The development process took several years and included a literature review, field testing, and revision of the indicators prior to approval by the College council. In their first year 155 health-care organizations (HCO) addressed the indicators and this rose to 210 in 1998. Data were received from all states and both public and private facilities.*	*The collected data for 1997 and 1998 for some of the indicators revealed rates which were comparable with those reported in the international literature. For example, the rates of bile duct injury in laparoscopic cholecystectomy were 0.7 and 0.53%, respectively; the mortality rates for coronary artery graft surgery were 2.5 and 2.1%, respectively; the mortality rates after elective abdominal aortic aneurysm repair were 2.5 and 3.7%, respectively; and the post-tonsillectomy reactionary haemorrhage rates were 0.9 and 1.3%, respectively. Results for some indicators differed appreciably from other reports, flagging the need for further investigation; for example, the negative histology rates for appendectomy in children were 18.6 and 21.2%, respectively, and the rates for completeness of excision of malignant skin tumours were 90.7 and 90%, respectively. The significance of these figures, however, depends upon validation of the data and their reliability and reproducibility. Because reliability can be finally determined only at the hospital level they are of limited value for broader comparison.*	*The process of review established for the indicator set has led to refinement of some indicators through improvement of definitions, and to a considerable reduction in the number of indicators to 29 (covering 18 procedures), for the second version of the indicators (which was introduced for use from January 1999). The clinical indicator programme, as it has with other disciplines, hopefully will provide a stimulus to the modification and improvement of surgical practice. Clinician ownership should enhance the collection of reliable data and hence their usefulness*
Da Silva et al (2009)[46]	*To analyse the sensitivity and specificity of clinical indicators of ineffective airway clearance in children with congenital heart disease and to identify the indicators*	*The precise establishment of nursing diagnoses has been found to be one of the factors contributing to higher quality of care and cost reduction in healthcare institutions. The use of indicators to diagnose ineffective airway clearance could improve care of children with congenital heart disease.* *Longitudinal study. Participants*	*A nursing diagnosis of ineffective airway clearance was made in 31% of patients on the first assessment, rising to 71% on the last assessment, for a 40% increase. Sensitivity was highest for Changes in Respiratory Rates/Rhythms (0Â·99), followed by Adventitious Breath Sounds (0Â·97), Sputum Production (0Â·85) and Restlessness (0Â·53). Specificity was*	*The use of simple indicators in nursing diagnoses can improve identification of ineffective airway clearance in children with congenital heart disease, thus leading to early treatment of the problem and better care for these children.*

Author	Purpose	Design and method	Outcome measures and results	Conclusion
	that have high predictive power.	*consisted of 45 children, <=1 year of age, with congenital heart disease, who had not had definitive or palliative surgical correction. Six assessments were made at 2-day intervals. Each clinical indicator was defined based on previously established operational criteria. Sensitivity, specificity and positive and negative predictive values of each indicator were calculated based on a model for the longitudinal data.*	*higher for Sputum Production (0Â·92), followed by Restlessness (0Â·73), Adventitious Breath Sounds (0Â·70) and Changes in Respiratory Rates/Rhythms (0Â·17). The best positive predictive values occurred for Sputum Production (0Â·93) and Adventitious Breath Sounds (0Â·80). Conclusions. Adventitious Breath Sounds followed by Sputum Production were the indicators that had the best overall sensitivity and specificity as well as the highest positive predictive values.*	
Gibberd et al (2004)[24]	*Although clinical indicators allow individual providers to monitor and improve their own performance and quality of care, another important role for the indicators is to provide comparative information across all providers. We show that the league table' approach is ineffective, and provide an alternative method that uses the comparative rates to quantify the potential for improvement at both the provider and the national level.*	*The methods are applied to English and Australian hospital clinical indicators. The key is to regard clinical indicators as screening tools that measure performance in one or more dimensions. All screening processes require explicit tests to determine whether the result should be classified as either positive (requires further investigation) or negative (requires continued monitoring). A clinical indicator will be defined as positive if any of the three following criteria are met: (1) large variation between all areas or hospitals, as defined by the 20th centile gains: requires improvement in the health care system; (2) large variation between strata (rural/urban, teaching/non-teaching, public/private, State): requires action in the relevant stratum; (3) outlier hospitals: requires quality improvement in the individual hospitals. Two techniques are used to determine whether any of the three criteria are positive: (1) empirical Bayesian*	*For 185 Australian indicators, 55 clinical indicators had system gains involving better outcomes for at least 1000 patients per indicator. Using a set of criteria and subjective judgement, we identified some key areas for quality improvement in Australia.*	*Ranking of hospitals does not quantify the potential gains that could be achieved. Indicators that measure health care processes should be reported by quantifying the potential gains, thus encouraging action. Estimating the gains across many indicators allows priorities to be established, such as identifying the areas with the greatest potential for improvement. The main tasks are to then provide the tools and resources to tackle those areas with the most gains.*

Author	Purpose	Design and method	Outcome measures and results	Conclusion
		estimation to calculate shrunken' rates; and (2) use of the 20th centile to quantify the potential gains or improvement.		
Haller et al (2009)[78]	*Clinical indicators are increasingly developed and promoted by professional organizations, governmental agencies, and quality initiatives as measures of quality and performance.*	*To clarify the number, characteristics, and validity of indicators available for anesthesia care, the authors performed a systematic review.*	*They identified 108 anesthetic clinical indicators, of which 53 related also to surgical or postoperative ward care. Most were process (42%) or outcome (57%) measures assessing the safety and effectiveness of patient care. To identify possible quality issues, most clinical indicators were used as part of interhospital comparison or professional peer-review processes. For 60% of the clinical indicators identified, validity relied on expert opinion. The level of scientific evidence on which prescriptive indicators ("how things should be done") were based was high (1a-1b) for 38% and low (4-5) for 62% of indicators.*	*Additional efforts should be placed into the development and validation of anesthesia-specific quality indicators.*
Hickey et al (2004)[31]	*The Brisbane Cardiac Consortium, a quality improvement collaboration of clinicians from three hospitals and five divisions of general practice, developed and reported clinical indicators as measures of the quality of care received by patients with acute coronary syndromes or congestive heart*	*An expert panel derived indicators that measured gaps between evidence and practice. Data collected from hospital records and general practice heart-check forms were used to calculate process and outcome indicators for each condition.*	*Our indicators were reliable (kappa scores 0.7-1.0) and widely accepted by clinicians as having face validity. Independent review of indicator-failed, in-hospital cases revealed that, for 27 of 28 process indicators, clinically legitimate reasons for withholding specific interventions were found in <5% of cases. Implementation and results. Indicators were reported every 6 months in hospitals and every 10 months in general practice. To stimulate practice change, we fed back indicators in conjunction with an education programme, and provided, when requested, customized analyses to different user groups. Significant improvement was seen in 17 of 40 process indicators over the course of the*	*Use of clinical indicators succeeded in supporting clinicians to monitor practice standards and to realize change in systems of care and clinician behaviour.*

Author	Purpose	Design and method	Outcome measures and results	Conclusion
	failure.		*project. Lessons learned and future plans. Lessons learnt included the need to: (i) ensure brevity and clarity of feedback formats; (ii) liberalize patient eligibility criteria for interventions in order to maximize sample size; (iii) limit the number of data items; (iv) balance effort of indicator validation with need for timely feedback; (v) utilize more economical methods of data collection and entry such as scannable forms; and (vi) minimize the burden of data verification and changes to indicator definitions. Indicator measurement is being continued and expanded to other public hospitals in the state, while divisions of general practice are exploring lower-cost methods of ongoing clinical audit.*	
MacKinnon et al (2008)[25]	*Preventable drug-related morbidity in patients with type 2 diabetes is a major concern. Our objective was to develop a set of Canadian clinical indicators of preventable drug-related morbidity (PDRM) and preventable care-related morbidity (PCRM) for type 2 diabetes.*	*Each study partner (Dalhousie University, Nova Scotia Department of Health, Diabetes Care Program of Nova Scotia, and Sobeys Pharmacy Group) was asked to identify the priorities of medication-related diabetes care from the Canadian Diabetes Association 2003 clinical practice guidelines using the nominal group technique. Based on the priorities identified, a survey was constructed listing the clinical outcome and pattern of care related to a number of possible PDRMs/PCRMs in patients with type 2 diabetes. Using the Delphi technique, an interdisciplinary panel of 10 experts scored each clinical indicator in an attempt to achieve consensus.*	*Education/reinforcement of targets was identified by the nominal group technique as the most important area in which to improve diabetes care. After 3 rounds of the Delphi technique, 21 consensus-based clinical indicators were generated. Nine indicators were on the initial survey in round 1, and 12 indicators were suggested by the expert panel in rounds 1 and 2.*	*The resulting 21 clinical indicators provide clinicians and decision-makers with valuable tools to measure the quality of medication use in patients with type 2 diabetes.*
Nguyen et al (2007)[70]	*The purpose of this study was to examine the*	*Two-year prospective observational cohort.* *Academic tertiary care facility.*	*Patients had a mean age of 63.8 +/- 18.5 yrs, Acute Physiology and Chronic Health Evaluation II score 29.6 +/- 10.6,*	*Implementation of a severe sepsis bundle using a quality improvement feedback to*

Author	Purpose	Design and method	Outcome measures and results	Conclusion
	outcome implications of implementing a severe sepsis bundle in an emergency department as a quality indicator set with feedback to modify physician behavior related to the early management of severe sepsis and septic shock	*Patients were 330 patients presenting to the emergency department who met criteria for severe sepsis or septic shock. Five quality indicators comprised the bundle for severe sepsis management in the emergency department: a) initiate central venous pressure (CVP)/central venous oxygen saturation (Scvo2) monitoring within 2 hrs; b) give broad-spectrum antibiotics within 4 hrs; c) complete early goal-directed therapy at 6 hrs; d) give corticosteroid if the patient is on vasopressor or if adrenal insufficiency is suspected; and e) monitor for lactate clearance.*	*emergency department length of stay 8.5 +/- 4.4 hrs, hospital length of stay 11.3 +/- 12.9 days, and in-hospital mortality 35.2%. Bundle compliance increased from zero to 51.2% at the end of the study period. During the emergency department stay, patients with the bundle completed received more CVP/Scvo2 monitoring (100.0 vs. 64.8%, p < .01), more antibiotics (100.0 vs. 89.7%, p = .04), and more corticosteroid (29.9 vs. 16.2%, p = .01) compared with patients with the bundle not completed. In a multivariate regression analysis including the five quality indicators, completion of early goal-directed therapy was significantly associated with decreased mortality (odds ratio, 0.36; 95% confidence interval, 0.17-0.79; p = .01). In-hospital mortality was less in patients with the bundle completed compared with patients with the bundle not completed (20.8 vs. 39.5%, p < .01).*	*modify physician behavior in the emergency department setting was feasible and was associated with decreased in-hospital mortality.*
O'Brien et al (2007)[35]	*In this paper, the first of 4 stages of a large study aiming to develop culturally and clinically valid clinical indicators to flag the achievement of mental health nursing standards of practice in New Zealand are described.*	*A bicultural design was employed throughout the research project to ensure that nurses' views of practice and the cultural differences between New Zealand's indigenous Maori and non-Maori peoples could be identified. Accordingly, separate focus groups of Maori- and non-Maori-experienced mental health nurses were asked to develop lists of statements reflective of the Australian and New Zealand College of Mental Health Nurses' Standards of Practice in New Zealand.*	*The focus group participants produced 473 statements, which were synthesised into 190 clinical indicator statements. In keeping with the bicultural research design, Maori and non-Maori data were analysed separately until the data were merged to provide a single set of indicator statements. Although both Maori and non-Maori groups wrote statements relevant to clinical practice, there was a difference in the way the 2 groups addressed cultural issues. The Maori focus group wrote statements about cultural issues for 4 of the 6 Standards of Practice, whereas the non-Maori focus group participants wrote statements about cultural issues for only*	*The research design of this project in mental health nursing was unique in that it sought the perspectives of both indigenous and non-indigenous nurses about quality mental health nursing practice related to the professional standards of practice. The involvement of Maori and non-Maori mental health nurses enhanced the cultural and clinical validity of the study and the data obtained from it. The bicultural approach adopted*

Author	Purpose	Design and method	Outcome measures and results	Conclusion
			the Standard focusing on cultural safety	*for the study highlights the need for more mental health nursing research involving indigenous partners.*
Weeks et al (2008)[69]	*Previous studies have compared measures of patient safety for veterans using the VA system to the general population. Discrepancies in the results of those studies suggest that the choice of an appropriate comparison group is critical for accurate interpretation of results and for determining whether to take actions to address findings. We explored another method of providing consumer information by comparing the experiences of VA enrolled patients who received care in the VA to those who received care outside the VA system.*	*For male veterans living in New York State and enrolled in the VA healthcare system, to determine (a) whether those who obtain care outside the VA system experience different measures of patient safety than those treated within the VA system, and (b) whether cross-system comparisons of measures of patient safety among older veterans reflect those of the full age spectrum.* *Retrospective cohort analysis.* *All VA and non-VA hospitals in New York State. PATIENTS: 353,570 male New York State residents who were enrolled in the VA system in 1998, 1999 or 2000 were included.*	*The Agency for Healthcare Research and Quality (AHRQ) has developed Patient Safety Indicators (PSIs) from hospital discharge data. To standardise these indicators across settings, AHRQ has provided software for risk-adjustment purposes so that the indicators can be compared across settings of care. We used the PSI software to calculate risk-adjusted PSI rates with 95% confidence intervals to compare veterans' inpatient care provided within and outside the VA system.* *Risk-adjusted rates for nine of 15 PSIs did not differ between care provided within and outside the VA system. However, compared with care provided outside the VA system, risk-adjusted rates of decubitus ulcer, postoperative sepsis, infection due to medical care, postoperative respiratory failure and postoperative metabolic derangement occurred at lower rates within the VA system, while death in low mortality DRGs occurred at a higher rate in the VA system. Findings for patients aged 65 and older were similar to those of the entire age spectrum.*	*Using AHRQ's PSI software, male veterans in New York who obtain their inpatient care within the VA received care that was comparable with or somewhat better than those who obtained their inpatient care outside the VA. The experiences of older patients reflected those of younger patients. Given that our findings are much more similar to reported comparisons between the VA and Medicare than to comparisons between the VA and the general population, we conclude that, should system comparisons be made, choice of comparison groups will be critical to accurate interpretation of findings; however, prior to such interpretation, the validity of the PSIs must be determined within VA.*

Appendix D: Bibliography and abstracts

Abe, S., N. Sukoh, et al. (1994). "Clinical indicators of malignancy of lung cancer." Hokkaido Igaku Zasshi - Hokkaido Journal of Medical Science **69**(3): 391-5.
To evaluate the malignancy of lung cancer, nuclear DNA content, AgNORs counts and cathepsin B activity were examined. The survival time of small cell carcinoma patients with limited disease of near diploid is longer than that with limited disease of hyperdiploid pattern. By flow cytometric technique, the proportion of DNA aneuploid pattern were higher in adenocarcinoma than in squamous cell carcinoma. In squamous cell carcinoma, the prognosis of patients with DNA aneuploid pattern was worse. However, there was no significant difference in survival time of adenocarcinoma patients. A good correlation between the AgNORs counts and tumor volume doubling time of non-small cell carcinoma of lung was observed. However, the AgNORs counts were an independent prognostic factor for survival time of patients with lung cancer. The survival time of lung cancer patients with the marked intensity of cathepsin B was significantly shorter than that of patients with negative and/or weak positive staining pattern. The AgNORs value and cathepsin B activity can serve as a pertinent marker for clinical assessment of malignancy of lung cancer. [References: 18]

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The activity of creatine kinase (CK) and creatine kinase B(CK-B) was measured in 17 patients with injuries to multiple organ systems, including the chest. The patients were closely observed for clinical signs of disturbed cardiac function by means of serial ECG, continuous monitoring of cardiac rhythm, daily cardiac auscultation, serial chest roentgenography and monitoring of central hemodynamic parameters. No statistically significant difference in CK and CK-B activity was found between the group of patients with normal cardiac function and the group with disturbed cardiac function. The CK-B activity was markedly elevated, but CK-B activity relative to CK activity was normal in both groups during the first 7 days after the trauma. The authors conclude that the significance of these enzymes' serum activity, measured with the immunoinhibition method, is diagnostically doubtful not only as regards cardiac contusions, but also in other cardiopathy preceding or following major trauma.

Anderson, B. G. and J. A. Noyce (1992). "Clinical indicators and their role in quality management." Australian Clinical Review **12**(1): 15-21.
In this paper the authors look at the proactive role performance indicators can and should play in managing for quality in health care facilities. In particular, they highlight the use of clinical indicators as a means of providing evidence of value-for-money and best quality delivery of care. The argument is presented that management can no longer ignore indicators as a quality assurance tool and an important component of managing for quality over time. The authors demonstrate where indicators fit into the traditional quality assurance cycle and describe strategies for analysing problems and setting priorities. They also argue that managers need to invest in management information systems in order to provide the data needed for performance monitoring. Accurate and complete indicator data are needed if the goals of quality management and optimal quality of care are to be achieved.

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This article will appear early next year as Chapter 2 in the Primer on Clinical Indicator Development and Application, a Joint Commission guidebook on clinical indicators. This section of the Primer defines clinical indicators and discusses their use in monitoring and evaluating factors in patient care. Examples are given of the two types of indicators, sentinel event and rate-based, which may measure either outcomes or processes of care. An

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Aquarius, A. E., J. De Vries, et al. (2006). "Clinical indicators and psychosocial aspects in peripheral arterial disease." Archives of Surgery **141**(2): 161-166.
Hypothesis: Patients with peripheral arterial disease (PAD) often experience substantial impairment in health status and quality of life (QOL), but factors associated with these outcomes are unknown. We hypothesized that subjective pain symptoms in the legs and social support and stress (the degree to which situations are appraised as stressful) are associated with impaired health status and QOL. Design: Cross-sectional observational study. Setting: Vascular outpatient clinic of a teaching hospital. Patients: The study included consecutive patients seeking treatment for the first time because of walking pain. Diagnosis and severity of PAD were based on history, physical examination, treadmill-walking distance, and ankle-brachial pressure indexes (ABPIs). Patients with PAD (n=188) and patients with atypical leg symptoms (n=57) completed the 10-item version of the Perceived Stress Scale (perceived stress), the 12-item version of the Perceived Social Support Scale-Revised (social support), the RAND 36-Item Health Survey (health status), and the World Health Organization Quality of Life Assessment Instrument-100. Main Outcome Measures: Health status and QOL. Results: Both groups had equally poor health status and QOL, with patients with atypical leg symptoms reporting more bodily pain (P=.004). In patients with PAD, the ABPI (P=.008) and perceived stress (P=.001) were associated with maximum walking distance. Furthermore, the health status domain of physical functioning was affected by the ABPI (P=.002), cardiac disease (P=.005), body mass index (P=.007), and perceived stress (P<.001). Overall QOL in patients with PAD was independently influenced by sex (P=.04), carotid disease (P=.03), and perceived stress (P<.001). Conclusions: Subjective pain in the legs is associated with impaired health status and QOL. Stress adversely influences the health status and QOL of patients with PAD above and beyond the influence of clinical indicators. These findings indicate the importance of accounting for perceived stress in patients with PAD.

Arah, O. A., G. P. Westert, et al. (2006). "A conceptual framework for the OECD Health Care Quality Indicators Project." Int J Qual Health Care **18**(suppl_1): 5-13.
Issues. The Health Care Quality Indicator (HCQI) Project of the Organization for Economic Cooperation and Development (OECD), which is aimed at developing a set of indicators for comparing the quality of health care across OECD member countries, requires a balanced conceptual framework that outlines the main concepts and domains of performance that should be captured for the current and subsequent phases of the project. Addressing the issues. This article develops a conceptual framework for the OECD's HCQI Project. It first argues that developing such a framework should start by addressing the question, performance of what--and to what ends?' We identify at least two different major classes of frameworks: (i) health and (ii) health care performance frameworks, both of which are in common use. For the HCQI, we suggest a conceptual framework that is largely a purposeful modification of the existing performance frameworks and which is driven by the health determinants model. Conclusions. The conceptual basis for performance frameworks can be

traced back to the health determinants model. A health performance framework takes a broader, societal or public health view of health determination, whereas a health care performance takes a narrower, mostly clinical or technical view of health care in relation to health (needs). This article proposes an HCQI framework that focuses on the quality of health care, maintains a broader perspective on health and its other determinants, and recognizes the key aims of health policy.

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Objective - To determine the effect of long-term administration of enalapril on renal function in dogs with severe, compensated mitral regurgitation. Design - Randomized controlled trial. Animals - 139 dogs with mitral regurgitation but without overt signs of heart failure. Procedure - Dogs were randomly assigned to be treated with enalapril (0.5 mg/kg [0.23 mg/lb], PO, q 24 h) or placebo, and serum creatinine and urea nitrogen concentrations were measured at regular intervals for up to 26 months. Results - Adequate information on renal function was obtained from 132 dogs; follow-up time ranged from 0.5 to 26 months (median, 12 months). Mean serum creatinine and urea nitrogen concentrations were not significantly different between dogs receiving enalapril and dogs receiving the placebo at any time, nor were concentrations significantly different from baseline concentrations. Proportions of dogs that developed azotemia or that had a 35% increase in serum creatinine or urea nitrogen concentration were also not significantly different between groups. Conclusions and Clinical Relevance - Results suggest that administration of enalapril for up to 2 years did not have any demonstrable adverse effects on renal function in dogs with severe, compensated mitral regurgitation.

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F₂-isoprostanes are prostanoids produced independently of cyclooxygenase by free radical-catalyzed peroxidation of arachidonic acid containing lipids. Quantification of F₂-isoprostanes from biological fluids and tissues represents an important advance in the detection and measurement of lipid peroxidation in vivo. In addition, the biophysical effects of isoprostane-containing lipids and the biological effects of free isoprostanes provide potential mechanisms for oxidant stress-related alterations in homeostasis. F₂-isoprostane measurement in experimental models of free radical-induced injury and human disease may allow better design and evaluation of antioxidant therapeutic strategies.

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Background: In 1989, Ramsey Family and Community Medicine Residency adopted a population-based focus for teaching and clinical activities based on the principles of community-oriented primary care (COPC). Evaluation and outcomes measurement proved problematic for each of the five COPC projects we implemented. Methods: Surrogate measures, or key clinical indicators, were used to monitor the following COPC projects at Ramsey Family Physicians clinic: preschool immunization, family-centered birth, intimate interpersonal violence, teenage pregnancy-sexually transmitted disease prevention, and human immunodeficiency virus (HIV) screening. Results: Between 1995 and 1998, we documented a decline in preschool immunization rates, an increase in preterm births and low-birth-weight infants, improved intimate interpersonal violence screening, a high but stable teenage pregnancy rate, a decrease in teenage chlamydia rate, and improved HIV prenatal screening. Our data collection and analysis were complicated by a lack of relevant indicators related to target goals, a shifting denominator, incomplete data and an unstable numerator, disconnected data sources, and missing comparison data. Conclusions: COPC project evaluation is an evolving process, and measurement deficiencies become recognized with time. Even so, outcomes measurement legitimizes COPC interventions and provides a value-added component to resident education and clinical activities.

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Aims: To evaluate the predictive value of symptoms, signs, and radiographic findings accompanying presumed ventriculoperitoneal (VP) shunt malfunction, by comparing presentation with operative findings and subsequent clinical course. Methods: Prospective study of all 53 patient referrals to a paediatric neurosurgical centre between April and November 1999 with a diagnosis of presumed shunt malfunction. Referral pattern, presenting symptoms and signs, results of computed tomography (CT) scanning, operative findings, and clinical outcome were recorded. Two patient groups were defined, one with proven shunt block, the other with presumed normal shunt function. Symptomatology, CT scan findings, and the subsequent clinical course for each group were then compared. Results: Common presenting features were headache, drowsiness, and vomiting. CT scans were performed in all patients. Thirty seven had operatively proven shunt malfunction, of whom 34 had shunt block and three shunt infection; 84% with shunt block had increased ventricle size when compared with previous imaging. For the two patient groups (with and without shunt block), odds ratios with 95% confidence intervals on their presenting symptoms were headache 1.5 (0.27 to 10.9), vomiting 0.9 (0.25 to 3.65), drowsiness 10 (0.69 to 10.7), and fever 0.19 (0.03 to 6.95). Every patient with ventricular enlargement greater than their known baseline had a proven blocked shunt. Conclusions: Drowsiness is by far the best clinical predictor of VP shunt block. Headache and vomiting were less predictive of acute shunt block in this study. Wherever possible CT scan findings should be interpreted in the context of previous imaging. We would caution that not all cases of proven shunt blockage present with an increase in ventricle size.

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How successful has the nGMS contract been in raising standards of CHD care? Dr Alan Begg discusses the progress his practice has made during the first year.

Beijing Group of National Research Project for, S. and S. Beijing Group of National Research Project for (2003). "Dynamic changes in blood cytokine levels as clinical indicators in severe acute respiratory syndrome." Chinese Medical Journal **116**(9): 1283-7.
OBJECTIVE: To investigate the dynamic changes observed in serum levels of interleukins (ILs), tumor necrosis factor-alpha (TNF-alpha) and transforming growth factor-beta1 (TGF-beta1) in severe acute respiratory syndrome (SARS) patients. METHODS: Sixty-one cases of SARS with positive antibodies to SARS coronavirus (SARS-CoV) were classified into the following categories: initial stage (3 - 7 days), peak stage (8 - 14 days), and remission and recovery stage (15 - 27 days). Forty-four healthy individuals were used as controls. Serum levels of ILs, TNF-alpha and TGF-beta 1 were measured in all subjects. Serum antibodies to SARS-CoV were detected only in SARS cases. RESULTS: The mean concentration of serum IL-6 in SARS patients did not differ from that in the control group in initial and peak stages, but became significantly higher in remission and recovery stage compared with the control group, initial and peak stages ($P < 0.01$). The mean concentration of serum IL-8 in SARS patients did not differ from that of the control group in initial stage, but was significantly higher than control group in peak stage and remission and recovery stage ($P < 0.05$). And it was more significantly higher in remission and recovery stage than in peak stage ($P < 0.01$). The mean concentrations of IL-16 and TNF-alpha in SARS patients were higher than those of the control group for every length of the clinical courses investigated, and were especially high in remission and recovery stage ($P < 0.01$). SARS patients experienced higher concentration of serum IL-13 compared with the controls in initial stage ($P < 0.01$), but returned to normal levels in peak stage and in remission and recovery stage. The mean concentration of serum IL-18 in SARS patients was significantly lower than that of the control group during all clinical courses ($P < 0.05$). The mean concentration of serum TGF-beta1 in SARS patients was higher than that of the control group during all clinical courses. Although TGF-beta1 in serum decreased in remission and recovery stage in SARS patients, the average was still higher than that of the control group ($P < 0.01$). CONCLUSIONS: Most proinflammatory cytokines and TGF-beta 1 were elevated during the early phase of SARS, which may be associated with lung infiltration and proliferation. Concurrently, the mean concentration of serum IL-13 decreased gradually, and the mean concentration of serum IL-18 level in SARS patients was lower than that of the control group during all the courses of SARS, suggesting that the immune state of the patients with SARS was obviously abnormal. Observing the dynamic changes in blood cytokine levels can provide a scientific basis to assess pathogenesis and efficacy of clinical treatment of SARS.

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We conducted a review of 98 cases of pediatric traumatic parietal skull fracture in which computed tomographic (CT) scans of the head were obtained during a seven-year period. There were 69 instances of an associated intracranial lesion identified in 47 children, including parenchymal injury (23), epidural hematoma (17), subdural hematoma (11), cerebral edema (ten), and subarachnoid hemorrhage (eight). Compared with 51 other children with parietal skull fracture and normal CT scans, the clinical characteristics significantly associated with the presence of an intracranial lesion were symptoms of neurologic dysfunction (loss or altered level of consciousness and/or seizure activity), neurologic compromise on

examination (altered level of consciousness and/or focal deficit), or complicated skull fracture (bilateral, diastatic, and/or depressed). Of the 47 children with an intracranial lesion on CT scan, 44 had at least one of these significant clinical characteristics (sensitivity, 93%; specificity, 50%; positive-predictive value, 62%; and negative-predictive value, 96%). Children who sustain traumatic parietal skull fracture commonly experience associated intracranial injury. Those with evidence of neurologic deficit or complicated skull fracture are at particularly high risk, and should receive cranial CT scan evaluation.

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Network 1 (New England) initiated the Clinical Indicator Project to survey dialysis adequacy (Kt/V), nutrition (serum albumin level), and anemia management in patients maintained on chronic dialysis. Because little information is available in children, data were specifically recorded covering these variables In patients (age, 1 to 18 years) maintained on either hemodialysis (HD) or peritoneal dialysis (PD). During the 18 months of data collection, 29 observations were recorded on 23 HD patients (age, 14.3 +/- 3.6 years), and 43 observations were made on 30 PD patients (age, 10.6 +/- 4.7 years). Kt/V correlated inversely with the age of the patient (HD, $P < 0.004$; PD, $P < 0.0007$). Although serum albumin level was not associated with dialysis adequacy in HD patients, there was a strong inverse relationship between albumin level and Kt/V in PD patients ($P < 0.002$). Hematocrit values were not significantly different in the two groups (HD, 31.0% +/- 5.5% versus PD, 32.9% +/- 4.8%) and could not be correlated with weekly erythropoietin dose. Weekly erythropoietin dose was directly related to patient age in both groups (HD, $P < 0.05$; PD, $P < 0.02$). The weekly erythropoietin dosage needed to maintain the hematocrit was greater in HD patients (HD, 11,211 +/- 7,484 U versus PD, 3,790 +/- 1,968 U; $P < 0.0001$). We conclude that (1) smaller children in both groups tend to have a greater Kt/V, (2) Kt/V greater then 2.75 in PD patients may not improve nutrition per se and could result in increased albumin losses, and (3) erythropoietin dosing appears to correlate best with patient size (age) rather than degree of anemia. (C) 2000 by the National Kidney Foundation, Inc.

Brem, A. S., C. Lambert, et al. (2001). "Clinical morbidity in pediatric dialysis patients: Data from the Network 1 Clinical Indicators Project." Pediatric Nephrology **16**(11): 854-857.
The Health Care Financing Administration (HCFA) has gathered clinical data on end stage renal disease (ESRD) patients since 1994, but details are only available on patients [greater-than or equal to]18 years. In this report, we present morbidity data collected prospectively over 12 months from all children (1-18 years) maintained on either hemodialysis (HD) or peritoneal dialysis (PD) within the six-state New England area. During this year, 17 observations were recorded on 14 HD patients (age 13.4 +/- 11.3 years) and 36 observations were made on 25 PD patients (age 11.5 +/- 4.8 years; mean +/- SD). These patients were generally highly functional, attending school at least part time in nearly all cases. Dialysis adequacy index (DAI), defined as the delivered KT/V divided by DOQI guideline values, indicated that patients were well dialyzed (HD 1.41 +/- 0.1 and PD 1.10 +/- 0.1; mean +/- SE). When all dialysis patients were grouped and analyzed, the DAI did not correlate with number of hospitalizations, degree of anemia, serum albumin, or type of dialysis. The number of hospitalizations were greater the younger the patient ($P < 0.01$). The need for antihypertensive medications was higher in the children maintained on HD (94%) compared to children on PD (58%) ($P < 0.01$). Lastly, while serum ferritin did not correlate with serum iron, hematocrit or Epo dosage, it was inversely related to serum albumin ($P < 0.03$). We conclude that, in children, (1) exceeding suggested dialysis adequacy may not improve patient morbidity, (2) the need for antihypertensive medications appears greater in children maintained on HD, and (3) inflammation may play a role in determining serum albumin independent of nutrition.

Brooke, R. (1994). "Assessment for psychotherapy: Clinical indicators of self cohesion and self pathology." British Journal of Psychotherapy **10**(3): 317-330.
For a skilful psychotherapist clinical hunches may be finely differentiated and reliable, yet the evidence on which they are based tends to remain pre-articulate. The aim of this paper is to discuss this evidence and to organise it in terms of structural considerations regarding the cohesiveness of the self. The prognostic significance of these considerations is discussed.

The complexity of the issues and the value of thinking structurally are illustrated through a clinical study.

Browne, J. A., B. G. Covington, et al. (2004). "Embedding clinical indicators into nursing documentation." Studies in Health Technology & Informatics **107**(Pt 1): 332-5.
The Methodist Healthcare System of San Antonio audits completeness and accuracy of nursing assessments. Between 1996 and 2001, regardless of software enhancements and education, completeness of risk assessments hovered at 80% or less. Accuracy of risk scores were in question due to paste functionality. In review, it became apparent that many risk assessment indicators were already an intrinsic part of nursing systems assessment. This project embedded weighted indicators invisibly within systems assessment. Risk scores then automatically calculate and display. This approach decreased documentation queries and increased accuracy of risk assessments. Results were validated using concurrent manual review. Skin assessment demonstrated a 96% accuracy rate with 100% completeness of documentation. Fall assessment resulted in a 2.5% miss rate and 100% completeness of record. 100% of high risk patients identified had appropriate care plan problems. Recommendations are to further explore embedded indicators in software design. The study demonstrated a) decrease in nursing documentation queries b) increase in completeness of record c) increase in accuracy of record and d) increase in accuracy of care plan.

Bucher, B., D. Canonge, et al. (1997). "Clinical indicators of envenoming and serum levels of venom antigens in patients bitten by Bothrops lanceolatus in Martinique." Transactions of the Royal Society of Tropical Medicine and Hygiene **91**(2): 186-190.
An enzyme-linked immunosorbent assay was developed to measure venom antigen levels in the serum of 40 patients bitten by Bothrops lanceolatus. The grading system used for the severity of envenomation (grades 1 to 4, minor to major) was predominantly based on the presence of local signs. Serum venom levels increased with the grade of severity ($P < 0.001$, by Spearman's rank correlation test); they were 6 +/- 6 ng/mL (mean +/- SD) in clinically non-envenomed patients (grade 1, n = 3), 7.6 +/- 11.7 (n = 17), 44.3 +/- 41.8 (n = 17), and 80.3 +/- 34.1 ng/mL (n = 3) in patients diagnosed as grade 2, 3 and 4 respectively. However, venom antigens could not be detected in the serum of 54% of patients who showed clinical signs of envenomation. Most patients diagnosed as grade 2, 3 or 4 were given 20, 40 and 60 mL of a monospecific F(ab')2 antivenom, respectively. Venom concentrations [less-than or equal to] 15 ng/mL were observed in all patients with progressive aggravation of swelling despite the use of early antivenom therapy. No venom was detectable in blood samples taken after completion of serotherapy. All patients recovered. These results confirm the efficacy of both the clinical severity scoring system used and the therapeutic regimen.

Budreau, G. and C. Kleiber (1991). "Clinical indicators of infant irritability." Neonatal Network **9**(5): 23-30.

Burr, M. and M. Burr (1990). "Feasibility trial of concurrent casenote screening for clinical indicators to assure quality of care at a large Australian teaching hospital." Australian Clinical Review **10**(3): 114-6.

Campbell, S. M., J. A. Cantrill, et al. (2000). "Prescribing indicators for UK general practice: Delphi consultation study." BMJ: British Medical Journal **321**(7258): 425-428.

Canadian Institute for Health Information (2009). Canadian Institute for Health Information. Ottawa, Canadian Institute for Health Information.

Caraveo, J. J., C. Gonzalez, et al. (1985). "Clinical indicators of psychiatric change in general medical practice." Salud Publica de Mexico **27**(2): 140-8.

Carvalho, A. L., L. F. Silva, et al. (2008). "Clinical indicators of child development in the capitals of nine Brazilian states: the influence of regional cultural factors." Clinics (Sao Paulo, Brazil) **63**(1): 51-8.

Chang, B. L., G. C. Uman, et al. (1998). "Predictive power of clinical indicators for self-care deficit." Nursing Diagnosis **9**(2): 71-82.

PURPOSE: To describe the predictive power of a set of the best clinical indicators for the nursing diagnostic labels self-care deficit (SCD) and impaired physical mobility. METHODS: Patient assessment data (physical examination and interview) were obtained from 414 hospitalized patients. FINDINGS: Patients with the diagnostic label of self-care deficit were significantly older in age, had a greater number of nursing diagnoses, required greater assistance in activities of daily living, and were less mobile than those without the diagnostic label. While 18 of 32 clinical indicators were positively related to self-care deficit, five clinical indicators were sufficient to diagnose SCD. CONCLUSIONS: Further development of the method may be useful in improving diagnostic accuracy and efficiency of nursing diagnoses.

Chetter, I. C., P. Dolan, et al. (1997). "Correlating clinical indicators of lower-limb ischaemia with quality of life." Cardiovascular Surgery **5**(4): 361-366.
The objectives of the study were to analyse the impact of increasing lower-limb ischaemia upon quality of life and to assess the correlation between clinical indicators of lower-limb ischaemia and such quality. A prospective observational study of a consecutive series of 235 patients (144 men and 91 women; median age 68 (range 41-87) years presenting with varying degrees of lower-limb ischaemia graded according to ISCVS criteria was performed. Data was collected at interview before any intervention. Clinical indicators of lower-limb perfusion included: intermittent claudication and maximum walking distance on standardized treadmill testing; ankle:brachial pressure indices and isotope limb blood flow. Quality of life analysis was performed using the EuroQol (EQ) questionnaire. This is a standardized generic instrument for describing health-related quality of life and consists of a descriptive system of five dimensions, each measured on three levels. Thus, a profile and two single indices of quality of life were derived using different methods. Increasing lower-limb ischaemia results in a statistically significant deterioration in both global quality of life and in all EQ-measured quality of life dimensions ($P < 0.01$ Kruskal-Wallis, ANOVA). The correlation between clinical indicators and quality of life is statistically significant but not sufficiently close (correlation coefficients < 0.6) to assume that variations in clinical indicators result in reciprocal variations in quality of life. In conclusion, as might be expected, a significant correlation exists between clinical indicators of lower-limb ischaemia and health-related quality of life. However, the low correlation coefficients emphasize how tenuous the association is. Thus, a significant improvement in the clinical indicators of lower-limb ischaemia cannot be assumed to impart a similar benefit on quality of life. The latter concept must therefore be analysed independently.

Chung, K., M. Lai, et al. (2008). "Organization-based performance measures of cancer care quality: core measure development for breast cancer in Taiwan." European Journal of Cancer Care **17**(1): 5-18.

Chuong, J. J., E. M. Livstone, et al. (1982). "The histopathologic and clinical indicators of prognosis in hepatoma." Journal of Clinical Gastroenterology **4**(6): 547-52.
Two histopathologic subtypes of hepatoma, clear cell type and fibrolamellar type, have been reported to indicate a longer survival. Although data on the prognostic value of clear cell histology is equivocal, evidence for prolonged survival (mean survival: 32-68 months) for patients with fibrolamellar type is impressive. Aggressive surgical intervention, including resection of metastases, appears indicated in fibrolamellar hepatocellular carcinoma. Bilirubin determination may be a reliable indicator of survival, but conflicting results are reported for most reputed clinical prognostic markers. Discrepancies may reflect regional and ethnic differences in the pathogenesis of hepatoma. We present an illustrative case of fibrolamellar hepatoma discovered in a 24-year-old woman with migratory thrombophlebitis. The patient successfully underwent an extended right hepatic lobectomy and is currently free of disease. We review the histopathologic and clinical prognostic features of fibrolamellar carcinoma and hepatoma.

Claffey, N., J. Egelberg, et al. (1995). "Clinical indicators of probing attachment loss following initial periodontal treatment in advanced periodontitis patients." Journal of Clinical Periodontology **22**(9): 690-6.
16 advanced periodontitis patients were subjected to initial periodontal treatment and monitored every 3rd month during 42 months. Clinical characteristics at baseline and during the 42-month maintenance period were investigated for their association with probing attachment loss over the 42-month period, both on a patient level and on a site level. On a

patient level, averaged full-mouth plaque and bleeding on probing scores over the maintenance interval showed little association with probing attachment loss. Little association was also observed for % sites with depth > or = 6 mm at baseline. However, a notable relationship was seen for % sites > or = 6 mm at 3 months. This finding initiated a separation of the 16 subjects into 2 groups based upon % sites > or = 6 mm at 3 months (groups 'high' and 'low'). Site level analyses for these groups showed little association between frequent presence of plaque at the sites over the maintenance interval and probing attachment loss. Frequent bleeding on probing showed limited relationship with attachment loss for group 'low', but an appreciable association for group 'high'. The findings suggest that advanced periodontitis patients with multiple residual probing depths > or = 6 mm at re-evaluation run a greater risk of developing sites with additional attachment loss than patients with few such residual depths. For such higher risk patients, bleeding on probing at maintenance examinations may be a useful indicator of subsequent deterioration at a site level.

Clarke, A. D., J. M. Howat, et al. (1999). "Hernia repair. Clinical indicators." Annals of the Royal College of Surgeons of England **81**(6): 434-5.

Clarke, A. D. and J. M. T. Howat (1999). "Clinical indicators." Annals of the Royal College of Surgeons of England **81**(6): 434-435.

Clinical Standards Board of Scotland (2002). Colorectal Cancer Services. Edinburgh, CSBS.

Coffey, R. M., R. M. Andrews, et al. (2005). "Racial, ethnic, and socioeconomic disparities in estimates of AHRQ patient safety indicators." Medical Care **43**(3): I-48-57.

Collopy, B., L. Rodgers, et al. (1999). "Clinical indicators for day surgery." Ambulatory Surgery **7**(3): 155-157.
As the number, variety and complexity of day procedures increase it is clearly important to ensure maintenance (and improvement) in the quality of the care given. To do so the Australian Day Surgery Council, assisted by the Australian Council on Healthcare Standards Care Evaluation Program, introduced five generic performance indicators. They were addressed by 240 healthcare organisations in 1997 reflecting the management of over 380 000 patients in day procedure facilities. Aggregate rates for the five indicators in 1997 were: failure to arrive, 1.5%; cancellation of procedure after arrival, 0.9%; unplanned return to operating room, 0.08% and unplanned delayed discharge, 0.56%. The unplanned overnight admission rate was significantly lower in freestanding than in attached facilities and significantly lower rates were noted for private compared with public facilities for all the indicators. Numerous actions were reported by 64% of organisations (as a result of indicator monitoring) including increased patient education, the production of information leaflets, establishment of pre-anaesthetic clinics, alteration of surgical techniques, introduction of drug trials and numerous policy changes.

Collopy, B. T. (1996). "Report on the introduction of clinical indicators in surgery." Journal of Quality in Clinical Practice **16**(4): 183-184.

Collopy, B. T. (2000). "Clinical indicators in accreditation: an effective stimulus to improve patient care." International Journal for Quality in Health Care **12**(3): 211-216.
The Australian Council on Healthcare Standards (ACHS) established the Care Evaluation Program (CEP) of clinical performance measures in its accreditation program to increase the clinical component of that program and to increase medical practitioner involvement in formal quality activities, in their health care organizations. From the introduction of a set of generic indicators in 1993 the program expanded through all of the various medical disciplines and from January 2000 there will be 18 sets (well over 200 indicators) in the program. More than half of Australia's acute hospitals (covering the majority of patient separations) are monitoring the indicators and reporting clinical data twice yearly to the ACHS. In turn they receive a 6-monthly feedback of aggregate and peer comparative results. The ACHS policy had no specific requirement for a set number of indicators to be monitored and it was not mandatory to achieve any specific data threshold to be accredited. However, where an organization's results differed unfavorably from those of its peers some action was expected. Qualitative information is also sent to the CEP and this has enabled a determination of the effectiveness

of the indicators. There is documented evidence of improved management and numerous examples of improved patient outcomes. The program remains unique in the scope of the medical disciplines covered and in the formal provider involvement with indicator development. Both the clinical component of accreditation and clinician involvement in quality activities have been increased in an educational process. However, not all of the indicators are of equal value and a reduction in the number of indicators to a 'core' group of the most reliable and responsive ones is in process.

Collopy, B. T. (2005). "Target and tailor the data." Healthcare Papers **6**(2): 40-45.

Collopy, B. T. and B. T. Collopy (1990). "Developing clinical indicators: the ACHS Care Evaluation Program." Australian Clinical Review **10**(2): 83-5.

Collopy, B. T. and B. T. Collopy (1994). "Clinical indicators as a stimulus to QA in hospitals an early report." International Journal for Quality in Health Care **6**(4): 331-8.
To increase medical staff involvement in hospital quality assurance activities and to increase the clinical component of a hospital accreditation process, the Australian Council on Health Standards (ACHS) through its Care Evaluation Program (CEP) has combined with the Medical Colleges, which are the professional associations for surgeons, internists, etc. Objective measures of care (clinical indicators) have been developed, and the first set (Hospital Wide Medical Indicators--HWMIs) was introduced into the Accreditation process from January 1993. Both quantitative and qualitative information is being received back by the Care Evaluation Program. The latter information reveals that the indicators have stimulated an increase in QA in hospitals.

Collopy, B. T., L. Rodgers, et al. (2000). "Early experience with clinical indicators in surgery." Australian and New Zealand Journal of Surgery **70**(6): 448-451.
Background: In 1997 a set of 53 clinical indicators developed by the Royal Australian College of Surgeons (RACS) and the Australian Council on Healthcare Standards (ACHS) Care Evaluation Programme (CEP), was introduced into the ACHS Evaluation and Quality Improvement Programme (EQuIP). The clinical indicators covered 20 different conditions or procedures for eight specialty groups and were designed to act as flags to possible problems in surgical care. Methods: The development process took several years and included a literature review, field testing, and revision of the indicators prior to approval by the College council. In their first year 155 health-care organizations (HCO) addressed the indicators and this rose to 210 in 1998. Data were received from all states and both public and private facilities. Results: The collected data for 1997 and 1998 for some of the indicators revealed rates which were comparable with those reported in the international literature. For example, the rates of bile duct injury in laparoscopic cholecystectomy were 0.7 and 0.53%, respectively; the mortality rates for coronary artery graft surgery were 2.5 and 2.1%, respectively; the mortality rates after elective abdominal aortic aneurysm repair were 2.5 and 3.7%, respectively; and the post-tonsillectomy reactionary haemorrhage rates were 0.9 and 1.3%, respectively. Results for some indicators differed appreciably from other reports, flagging the need for further investigation; for example, the negative histology rates for appendectomy in children were 18.6 and 21.2%, respectively, and the rates for completeness of excision of malignant skin tumours were 90.7 and 90%, respectively. The significance of these figures, however, depends upon validation of the data and their reliability and reproducibility. Because reliability can be finally determined only at the hospital level they are of limited value for broader comparison. Conclusion: The process of review established for the indicator set has led to refinement of some indicators through improvement of definitions, and to a considerable reduction in the number of indicators to 29 (covering 18 procedures), for the second version of the indicators (which was introduced for use from January 1999). The clinical indicator programme, as it has with other disciplines, hopefully will provide a stimulus to the modification and improvement of surgical practice. Clinician ownership should enhance the collection of reliable data and hence their usefulness.

Collopy, B. T., J. Williams, et al. (2000). "The ACHS Care Evaluation Program: A decade of achievement." Journal of Quality in Clinical Practice **20**(1): 36-41.
Abstract In 1989 the Australian Council on Healthcare Standards (ACHS) embarked on a programme to develop acute health care clinical indicators in conjunction with the Australian

medical colleges. Through a carefully structured stepwise process this collaboration established a 'World first' in 1993 with the introduction of the first set of indicators into the ACHS Accreditation programme. The programme remains unique in the formal involvement of providers in the development process and in the scope of the clinical areas covered in acute health care. From the year 2000 there will be 18 sets (and over 200 indicators) from which health care organisations (HCOs) can choose to monitor the major services they provide. There remains no compulsion to address a specific number of indicators. The growth of the programme has been considerable with more than half of the nations' acute HCOs reporting their clinical indicator data (twice yearly) and it provides a reflection of the care given for the majority of patient separations in acute care. This reporting process allows HCOs to receive feedback on the aggregate results together with comparative peer group information for each indicator they address. In addition to numerous publications in peer reviewed journals an annual aggregate report, 'the Measurement of Care in Australian Hospitals' is published. It reports both qualitative and quantitative data on all indicator sets for the preceding year. Validity of the indicators is strengthened each year with a review process and reliability and reproducibility of the data can now be demonstrated. The clinical response to the indicators has been overwhelming and there is now documented evidence of numerous actions taken by HCOs to improve both the processes and the outcomes of patient care. The nation wide database can be expected to reflect trends in care over the next few years. The process of indicator refinement, however, will continue and it is likely that a reduction in the total number of indicators will occur with a core group of the more 'robust' indicators remaining. Further directions in indicator development are likely to be in the area of multidisciplinary care and in the assessment of longer-term outcomes. In addition to measures of the quality of care, hopefully, in time, health care providers will also take part in the establishment of measures of the appropriateness of that care.

Commons Treloar, A. J. and A. J. Lewis (2009). "Diagnosing borderline personality disorder: examination of how clinical indicators are used by professionals in the health setting." Clinical Psychologist **13**(1): 21-27.
This paper reviews the history of the recognition of borderline personality disorder as a clinical disorder, followed by a review of the contemporary practice of diagnosing borderline personality disorder in psychiatric settings. Many researchers have cautioned against the conflation of difficult patients with the diagnostic category of borderline personality disorder. The current study examines how clinical indicators used to screen for this complex disorder differ across service settings, professions, specialised training and years of clinical experience. A purpose-designed survey was administered to 108 mental and emergency medicine health practitioners across an Australian health service and a New Zealand health service to record the level of significance placed on different clinical indicators in the application of the diagnosis of borderline personality disorder. A heavy reliance was placed on observable behavioural symptoms, such as self-mutilation and impulsive behaviours that are self-damaging, in the screening of borderline personality disorder as a psychiatric diagnosis. Statistically significant differences were found between emergency medical staff and mental health clinicians in their use of diagnostic indicators of borderline personality disorder, xÂ²(4) = 17.248, p = .002. Implications of these findings for the screening, assessment and diagnosis of patients with borderline personality disorder are discussed.

Considine, J. (2005). "The reliability of clinical indicators of oxygenation: a literature review." Contemporary Nurse: A Journal for the Australian Nursing Profession **18**(3): 258-267.
Despite oxygen being one of the most frequently administered substances in the hospital environment, there is little empirical data regarding its use. Review of the literature regarding the clinical assessment of hypoxia and hypoxaemia reveals inconsistency in the definition of terms and raises questions as to the reliability of the clinical indicators currently used to assess the need for supplemental oxygen. Assessment of the need for supplemental oxygen and continued re-evaluation of the patient's oxygen requirements is a nursing responsibility. Physical assessment, in combination with pulse oximetry, is the most common method used by nurses to assess oxygenation status. This paper critically appraises the literature to examine the reliability of clinical indicators of oxygenation used by nurses in acute care settings.

Consiglio, E. and W. H. Belloso (2003). "New clinical indicators. Health-related quality of life."

Medicina **63**(2): 172-178.
In the last decades the need of better measurements of health outcomes has increased the interest for new clinical indicators. Health-related quality of life (HRQoL) has emerged in this context as a multidimensional model approach where the patient is the exclusive source of information. The main objective of HRQoL measurement is to provide a global evaluation of the impact of diseases and the consequences of treatments over the daily life of the patients. The instruments developed for that purpose are questionnaires; either generic - for the comparison between different diseases-, or specific -aimed to evaluate particular conditions. These questionnaires must demonstrate several psychometric properties, such as reliability, validity, responsiveness, and for some authors also feasibility. In many areas, HRQoL studies have demonstrated to increase the knowledge of the natural history of diseases and its global consequences, beyond the classic health outcomes information based on morbidity and mortality rates. This knowledge may assist in the design of epidemiological studies and improve the comparison of strategies in therapeutic interventions. Nevertheless, some controversial issues remain such as the clinical implications of absolute scores obtained, and the need for updating the content of the instruments in accordance with the changes in natural history of diseases under evaluation.

Cooney, E. L. (2002). "Clinical indicators of immune restoration following highly active antiretroviral therapy." Clinical Infectious Diseases **34**(2): 224-233.
The course of human immunodeficiency virus (HIV) disease is characterized by a progressive decline in immune function. The advent of highly active antiretroviral therapy (HAART) has allowed patients to experience a significant degree of immune restoration when compared with the era before the availability of HAART. Multiple studies, which have employed sophisticated in vitro measures of immune function, have demonstrated improvement in CD4⁺ lymphocyte (T4) responses to various opportunistic pathogens. In addition, for patients treated during acute HIV infection, HIV-specific T4 responses have been restored. By contrast, there are a limited number of in vivo measures of T4 function available to assess immune recovery following initiation of HAART. The primary measurement is an increase in CD4 lymphocyte count, the significance of which may be underappreciated. Delayed-type hypersensitivity testing to recall antigens and serological response to prophylactic vaccines may also have a role. This review discusses available markers of immune function and offers suggestions regarding their use in HAART recipients.

Coory, M., K. Fong, et al. (2006). "Why we need a population-based approach to clinical indicators for cancer: A case study using microscopic confirmation of lung cancer in Queensland." Internal Medicine Journal **36**(6): 389-392.
An important function of clinical cancer registries is to provide feedback to clinicians on various performance measures. To date, most clinical cancer registries in Australia are located in tertiary academic hospitals, where adherence to guidelines is probably already high. Microscopic confirmation is an important process measure for lung cancer care. We found that the proportion of patients with lung cancer without microscopic confirmation was much higher in regional public hospitals (27.1%) than in tertiary hospitals (7.5%), and this disparity remained after adjusting for age, sex and comorbidities. The percentage was also higher in the private than in the public sector. This case study shows that we need a population-based approach to measuring clinical indicators that includes regional public hospitals as a matter of priority and should ideally include the private sector.

Courtney, M. and L. Spencer (2000). "What's best? Clinical indicators of quality in residential aged care facilities." Collegian **7**(2): 14-19.
This paper reports on the views of 36 registered nurses (RNs) in Phase One of a three stage study, Quality of Care for Residents in Aged Care Facilities. Case studies were conducted in nine residential aged care facilities and data were collected from informants using semi-structured interviews, participant observation and document analysis and review. Of the 36 RNs, almost three quarters (n=26) provided care at the bedside and ten held managerial positions. Each volunteered to participate. When asked to nominate the major clinical indicators of high quality residential aged care, all 26 RNs who worked at the bedside stated that the absence of decubitis ulcers was the pre-eminent measurable factor. While five managerial RNs also mentioned low rates of pressure ulcers, only two ranked it as the most important clinical indicator of high quality care. Hydration management was the clinical

indicator nominated most frequently by managerial nurses. The one indicator of equal importance to both groups, but for different reasons, was that of poly pharmacy. The differences in priorities between each group were statistically significant.

Coy, P., J. M. Elwood, et al. (1981). "Clinical indicators of prognosis in unresected lung cancer." Chest **80**(4): 453-8.
A prognosis estimate in palliative treatment for inoperable lung cancer is thought to be of value. Performance status is now recognized as being of major importance, but only recently has been consistently available. We examined other simple information not requiring clinical or laboratory tests that is available in the clinical histories of a series of 1,839 patients with unresected lung cancer. Actuarial survivals at 1, 2, and 5 years were 21.9, 7.8, and 2.0 percent, respectively. The median survival rate was 24 weeks. Squamous cell histology and an increasing interval between the first symptoms and diagnosis were associated with a better prognosis. The number of symptoms recorded at the time of assessment had strong negative association with survival; asymptomatic patients had a two-year survival of 26 percent compared with 6 percent or less with four or more symptoms. A similar discrimination is given by Feinstein's index, which combines information on the number and type of symptoms and on the interval between first symptom and diagnosis. The clinical stage was strongly related to survival. Additional statistical analysis showed that the prognostic value of each of the most powerful prognostic factors, the number of symptoms, and Feinstein's index was little altered by the use of data on stage and histology in addition. The data show a range of median survival of 18 to 60 weeks for Feinstein's indices from 6 to 1, suggesting that the symptom index is useful particularly in the relatively well patients and the performance status particularly in those more ill. The combination may be better than either alone, and it is recommended that such information be recorded for all lung cancer patients.

Crowley, B., K. Lubesnick, et al. (1991). "Clinical indicators: a tool for improving pain management documentation." Journal of Nursing Care Quality **6**(1): 40-46.

da Silva, V. M., Mv, et al. (2009). "Clinical indicators of ineffective airway clearance in children with congenital heart disease." Journal of Clinical Nursing **18**(5): 729-736.

Dagher, M., R. J. Lloyd, et al. (1992). "Emergency department clinical indicators." Nursing Management **23**(1): 64A.

Damjanovic, S. S., A. N. Neskovic, et al. (2005). "Clinical indicators of biochemical remission in acromegaly: Does incomplete disease control always mean therapeutic failure?" Clinical Endocrinology **62**(4): 410-417.
Objective: Correction of GH and IGF-I levels are associated with improvements in insulin secretion, cardiac performance and body composition in patients with acromegaly, but whether these parallel post-treatment levels of GH-IGF-I axis activity is undefined. We investigate whether various biochemical outcomes after transsphenoidal pituitary surgery (TSS) in these patients are associated with clinically relevant differences in cardiac performance, insulin resistance and body composition. Design: Cross-sectional study of consecutive patients with acromegaly admitted to the hospital between 2001 and 2002. Patients and methods: Forty-one patients after TSS for somatotroph pituitary adenoma and 23 patients with naive acromegaly serving as positive controls were enrolled in the study. Mean daily GH levels (mGH), IGF-I, leptin and lipid levels, glucose, insulin and GH concentrations during oral glucose tolerance test (oGTT) were measured in all study participants. Insulin resistance was measured by homeostatic model index (R_{HOMA}). Body composition was assessed by dual-energy X-ray absorptiometry. Left ventricular mass index (LVM_i) and cardiac index (C_i) were determined by echocardiography. Results: We found no difference in cardiac indices, insulin resistance, body composition and leptin levels between patients with complete biochemical remission and those with inadequately controlled disease (P > 0.05 for all) after TSS. Cured patients had lower values (mean +/- SD) of cardiac index (2.2 +/- 0.7 vs. 3.0 +/- 1.0 l/min/m²; P = 0.04) compared with naive patients. A similar decrease in LVM_i was observed in controlled (108.4 +/- 30.0 g/m²; P = 0.015) and inadequately controlled disease (108.8 +/- 30.7 g/m²; P = 0.03) in comparison with naive disease (160.3 +/- 80.6 g/m²). Insulin resistance and

leptin changed in opposite ways. In controlled and inadequately controlled disease, R_{HOMA} index was lower (2.2 +/- 1.4; P = 0.001 and 3.1 +/- 2.0; P = 0.05 vs. 5.1 +/- 3.1) while leptin concentration was higher (14.9 +/- 8.7 mug/l, P = 0.004 and 12.8 +/- 7.8 mug/l, P = 0.05 vs. 7.4 +/- 3.8 mug/l) than in naive disease. In all patients, leptin correlated negatively with cardiac index (r = -0.46; P = 0.001) and IGF-I levels (r = -0.45; P < 0.001). Independent predictors of biochemical remission, based on normal IGF-I levels only, were cardiac [P = 0.04, odds ratio (OR) 0.4; 95% confidence interval (CI) 0.2-0.9] and R _{HOMA} index (P = 0.009, OR 0.6; 95% CI 0.4-0.8). Similar results were obtained if the definition of cure included both normal IGF-I levels and the ability to achieve GH nadir < 1 mug/l during oGTT. Insulin resistance (P = 0.02, OR 0.6; 95% CI 0.4-0.9) and leptin level (P = 0.002, OR 1.3; 95% CI 1.1-1.6) were independent predictors of normalized mGH values. Conclusion: This study shows that cardiac indices, insulin resistance and body composition were not different between patients with complete biochemical remission and those with discordant GH and IGF-I levels. It appears that even incomplete disease control after TSS can result in improvement of these clinical markers. copyright 2005 Blackwell Publishing Ltd.

de Albuquerque Citero, V., P. B. de Araujo Andreoli, et al. (2008). "New potential clinical indicators of consultation-liaison psychiatry's effectiveness in Brazilian general hospitals." Psychosomatics **49**(1): 29-38.
The authors identified patients' subjective well-being (SWB), relatives' satisfaction with their information needs, and the medical team's difficulty in helping patients, as potential indicators of effectiveness of consultation-liaison psychiatry. A random sampling of 74 beds was carried out (1 bed=1 patient + 1 relative + 1 nurse + 1 physician). There were negative correlations between SWB and anxious and depressive symptoms, and positive correlations with nurses' difficulty in helping patients and patients' depressive symptoms, nurses' difficulty in helping patients and their perception about anxious and depressive symptoms; and physicians' difficulty in helping patients and their perception about anxious and depressive symptoms. Patients' SWB and difficulty in helping them constituted potential indicators in consultation-liaison psychiatry, whereas relatives' satisfaction did not.

De Paepe, L., P. Quaethoven, et al. (2000). "Use of clinical indicators in Flemish general acute hospitals. The Quality Indicator Project." Acta Hospitalia **40**(1): 55-67+96.
On October 1, 1998, the Centre for Health Services and Nursing Research, Leuven University, started a research project on the use of clinical indicators in Flemish general acute hospitals. The project questions the practical usefulness of the Acute Care Indicators of the Quality Indicator Project (QIP) of the Maryland Hospital Association. The QIP is a system for measuring clinical performance that consists of a set of validated, reliable, and generic indicators and rates. It is being used in over 1,900 hospitals worldwide. The article gives an overview of the QIP characteristics and its application in Flemish quality management.

Devaiah, A. K. and G. A. Ator (2000). "Clinical indicators useful in predicting response to the medical management of Meniere's disease." Laryngoscope **110**(11): 1861-1865.
Objectives: To identify factors that may correlate with responsiveness to medical management of Meniere's disease. Study Design: Retrospective chart review. Methods: The 1995 guidelines of the American Academy of Otolaryngology - Head and Neck Surgery (AAOHNS) Committee on Hearing and Equilibrium were used for data acquisition and measuring clinical response. New patients with 2 years' follow-up were evaluated and grouped as either medically or surgically treated. Patients were excluded for inadequate follow-up or prior otological surgery. Dietary sodium restriction (< 1500 mg/d) and a diuretic were employed initially. A compliance rating system was devised to evaluate diet adherence. Patients whose medical management failed were offered surgery. Results: Of 65 patients reviewed, 29 patients qualified for analysis. Seventeen patients were treated medically (patients had either definite or possible Meniere's disease), and 12 patients required surgery. Patients with definite Meniere's disease were at a higher stage (based on audiogram) than patients with possible Meniere's disease (P = .002). Patients who required surgery for Meniere's disease were at a higher stage than patients with either definite or possible disease (P < .001). Patients with definite disease had lower compliance than patients with possible disease (P = .004), but both groups showed symptom improvement. Patients with possible disease had better control than patients with definite disease (P < .001). Hearing was stabilized in patients with possible disease and improved at 500 Hz in patients with definite

disease (P = .04). Conclusions: Sodium restriction and diuretic treatment response are correlated to clinical measures of Meniere's disease. Patients with possible Meniere's disease should be treated with aggressive medical therapy to prevent disease progression.

Diacogiorgis, D. (2003). "Clinical indicators for intervention in the rehabilitation of inpatients." Australasian Journal of Podiatric Medicine **37**(4): 95-99.
The role of podiatry in the rehabilitation of inpatients can be a valuable contribution towards overall effective management. Ballarat Health Services Podiatry Department has reviewed its provision of service in this sub-acute setting, by developing a hierarchy of indicators for the implementation of treatment. In developing clinical indicators for intervention it is evident that underlying conditions, like diabetes, cerebrovascular accidents, rheumatoid arthritis and peripheral vascular disease, place patients more at risk of lower limb complications than patients without these conditions. In this clinical audit conducted over a month, 41 new patients admitted were screened on the rehabilitation ward, to assess their need for podiatric intervention. Time spent with each patient, their underlying conditions and the intervention implemented were recorded. The results showed that patients with diabetes, from a podiatric viewpoint accounted for the highest amount of time, especially if they had an amputation. Underlying conditions are the major players in determining who is in greater need of podiatric care, which in turn helps to target service provision, thereby facilitating the delivery of more holistic positive outcomes.

Dickson, N. (1999). "Body politic... England's first public clinical indicators." Nursing Times **95**(26): 22-22.
More questions than answers come out of the new clinical indicator tables, but that does not necessarily mean they are a bad thing, says Niall Dickson.

Donabedian, A. (1966). "Evaluating the quality of health care." Milbank Quarterly **44**: 166-206.

Douglas, C. W., R. W. Valachovic, et al. (1988). "Clinical indicators of radiographically detectable dental diseases in the adult patient." Oral Surgery, Oral Medicine, Oral Pathology **65**(4): 474-82.
A comprehensive analysis of the relationship between clinical observations in dental patients without symptoms and oral disease as detected by full-mouth and panoramic dental radiographs in a large population of patients has never been reported. Knowledge of these relationships is necessary in the design of a diagnostic decision process (clinical algorithm) that can predict which patients require dental radiographs for the diagnosis of dental caries or periodontal disease to be confirmed or refined. An accurate clinical algorithm could reduce the number of radiographs that are taken of certain routinely seen dental patients without symptoms, thus reducing unnecessary exposure x-radiation as well as potentially reducing health care costs for these patients. A sample of 602 adult men on whom a complete series of panoramic, posterior bitewing, and periapical dental radiographs and an independent oral examination were performed provided the opportunity to evaluate the relationship between clinically observed oral disease indicators and independent radiographic evidence of dental caries and periodontal disease. The analysis suggests that combinations of several clinical indicators can predict with some success which patients without symptoms will benefit most from oral radiographs. The presence of several carious lesions on oral examination was the best predictor of radiographic detection of dental caries. Clinical indicators tht appear to predict radiographic evidence of periodontal disease are clinical measures of pocket depth, mobility, and the patient's denture status. An important finding is that because of the high prevalence of gingivitis and plaque, these indicators were not related to radiographic evidence of periodontal disease.(ABSTRACT TRUNCATED AT 250 WORDS)

Duke, G., J. Santamaria, et al. (2005). "Outcome-based clinical indicators for intensive care medicine." Anaesthesia and Intensive Care **33**(3): 303-310.
The clinical indicator is a tool used to monitor the quality of health care. Its use in the Intensive Care Unit (ICU) is desirable for many reasons: the maintenance of minimum standards, the development of best practice and the delivery of cost-effective health care. The utility of clinical indicators in ICU is limited by the lack of universal, robust, transparent, evidence-based and risk-adjusted measures of quality, and the difficulties in defining "quality care" and "good outcome". Monitoring of adverse events, system descriptors, and resource

indicators is valuable but they have a limited relationship to the quality of care. ICU mortality prediction models provide a global measure of quality and, despite their inherent deficiencies, remain one of the most robust and useful clinical indicators.

Elliott, K. (2001). "Implementing nursing clinical indicators." Professional Nurse **16**(6): 1158-1161.
Nursing clinical indicators area practical, simple method of auditing important aspects of nursing care. Indicators are a way of fulfilling key aspects of the clinical governance agenda for nursing staff and multidisciplinary teams.

Enck, R. E. (1989). "A model for oncology clinical indicators." Cancer **64**(1 SUPPL.): 306-309.
The Clinical Indicator Core Committee met in Washington, DC on January 22 and 23, 1988 and has defined clinical indicators as items of clinical data which are as follows: clearly defined; available in the clinical record; easily documented; impact cancer care and outcomes; and discriminate between good and poor clinical cancer programs.

Ewing, H. P., R. J. Cade, et al. (1993). "Developing clinical indicators for cholecystectomy." Australian and New Zealand Journal of Surgery **63**(3): 181-185.

Fagiolini, A., E. Frank, et al. (2002). "Clinical indicators for the use of antidepressants in the treatment of bipolar I depression." Bipolar Disorders **4**(5): 277-282.
Objectives: Current guidelines provide little practical information on the clinical characteristics of bipolar I patients who are likely to benefit from the combination of a mood stabilizer and an antidepressant. Rather, guidelines simply state that an adjunctive antidepressant is recommended in cases of 'severe' depression. Our objective was to evaluate the clinical and demographic differences between patients who remitted on a mood stabilizer alone and patients who subsequently required an adjunctive antidepressant to achieve stabilization. Methods: We retrospectively compared the pharmacological treatment strategies of 39 patients with bipolar I disorder who were in a current depressive episode. Patients who did not respond to mood stabilizer monotherapy were prescribed an adjunctive antidepressant. We evaluated the clinical differences at baseline and week 1, 2 and 3 of treatment between patients stabilizing on a mood stabilizer alone and patients that did not remit until they subsequently received an adjunctive antidepressant. Results: Patients who required an adjunctive antidepressant had significantly higher total Hamilton Depression Rating (HRS-D) scores at week 1, 2 and 3 of treatment, but not at baseline. Patients who remitted on mood stabilizer monotherapy were more likely to be married, achieved stabilization in less time, presented with higher Young Mania Rating Scale (YMRS) scores, and experienced the previous episode of depression more recently than patients who required an antidepressant. Conclusions: Our findings suggest that rapid improvement after achieving a therapeutic dose of a mood stabilizer is clinically significant and represents a surrogate endpoint in the treatment of bipolar I depression. Larger, prospective, and controlled studies are needed to verify our results and to identify additional indicators for a mood stabilizer and antidepressant combination treatment strategy.

Fakioglu, H., B. R. Totapally, et al. (2005). "Hypoxic respiratory failure in term newborns: Clinical indicators for inhaled nitric oxide and extracorporeal membrane oxygenation therapy." Journal of Critical Care **20**(3): 288-293.
Purpose: The criteria for starting extracorporeal membrane oxygenation (ECMO) therapy in term newborn patients with hypoxemic respiratory failure consist of an oxygenation index (OI) of 25 or higher and alveolar-arterial oxygen (Aao₂) gradient of more than 600 at sea level. In such conditions, inhaled nitric oxide (iNO) may improve oxygenation and reduce the need for ECMO therapy. We studied early changes in OI and Aao₂ gradients in response to iNO treatment that may indicate a need to continue iNO treatment or the necessity to start an ECMO therapy. Materials and Methods: In this prospective study, we used 34 outborn neonatal patients that were referred to our pediatric critical care unit in a children's hospital for ECMO therapy with diagnosis of hypoxemic respiratory failure. In all patients, iNO therapy, starting at 80 ppm, was instituted either during transport or on arrival to hospital. Response to iNO was assessed after 1 hour, at which time, iNO concentration was reduced to 40 ppm, provided there was more than 20% improvement in either or both oxygenation indices. Patients who did not respond positively to continuous iNO therapy and

met ECMO criteria were given ECMO therapy. Results: Inhaled nitric oxide therapy alone was successful in 10 (29%) of 34 patients. Eighteen patients (53%) required ECMO therapy within the first 10 hours of iNO treatment (early ECMO therapy), whereas 6 other neonates (18%) became eligible for ECMO therapy after prolonged (2-4 days) iNO treatment (late ECMO therapy). No mortality occurred with any treatment. Within 4 hours after iNO therapy, patients who required early ECMO therapy had significantly higher OI and Aao₂ gradients than patients who were treated with iNO therapy alone (P < .01, analysis of variance followed by Tukey-Kramer multiple comparison test). Six of 34 patients (18%), categorized as late ECMO therapy, on the average, had initially higher levels of OI and mean airway pressure than neonates in iNO treatment and early ECMO therapy. Conclusion: Persisting levels of OI of more than 20 or Aao₂ gradients of more than 600 after 4 hours of iNO therapy could be indicative of an immediate need for ECMO therapy. copyright 2005 Elsevier Inc. All rights reserved.

Faron, G., M. Boulvain, et al. (1997). "A single cervical fetal fibronectin screening test in a population at low risk for preterm delivery: An improvement on clinical indicators?" British Journal of Obstetrics and Gynaecology **104**(6): 697-701.
Objective To assess the accuracy of a single cervical fetal fibronectin test to predict spontaneous preterm delivery in an unselected antenatal population. Design A prospective blind cohort study. Setting Antenatal clinic of a teaching hospital in a Brussels semiurban area. Participants An unselected group of 170 women followed at the antenatal clinic. Methods A single cervical sample was obtained between 24 and 33 completed weeks of pregnancy. The fibronectin test was compared with clinical evaluation and their predictive properties were assessed. Results Fifteen women were excluded from the analysis because of elective preterm delivery for medical indications or loss to follow up. Of the 155 remaining women, nine (7%) had a spontaneous preterm delivery. For a single fetal fibronectin test, the sensitivity was 26.7%, the specificity 95.7%, and the positive and negative predictive values 40.0% and 92.4%, respectively. The likelihood ratio of a positive was similar to that of clinical predictors of preterm birth (LR = 6.2; 95% CI 2.0-19.6). Sensitivities were low for both clinical criteria and the fetal fibronectin test. Conclusions Because of low sensitivity in a low risk population, screening for preterm delivery should not be based on the result of a single fetal fibronectin test alone. However, due to its high specificity the test might be useful in avoiding unnecessary medical intervention.

Fatti, G. L., H. J. Zar, et al. (2006). "Clinical indicators of Pneumocystis jiroveci pneumonia (PCP) in South African children infected with the human immunodeficiency virus." International Journal of Infectious Diseases **10**(4): 282-285.
Background: Pneumocystis pneumonia (PCP) caused by Pneumocystis jiroveci is common in HIV-infected children, producing substantial morbidity and mortality. Initiation of timely, effective therapy depends on clinical identification of children with PCP. Objective: To develop a clinical decision rule to diagnose PCP in HIV-infected children for use where diagnostic resources are limited. Methods: Analysis of data collected during a prospective incidence study of the etiology, features, and outcome of HIV-infected children hospitalized with pneumonia. Results: Four clinical variables were independently associated with a diagnosis of PCP in multivariate analysis: age <6 months (OR 15.6; 95% CI 2.4-99.8; p = 0.004), respiratory rate >59 breaths/min (OR 8.1; 95% CI 1.5-53.2; p = 0.018), arterial percentage hemoglobin oxygen saturation (SaO₂) [less-than or equal to]92% (OR 5.1; 95% CI 1.0-26.1; p = 0.052) and absence of history of vomiting (OR 11.2; 95% CI 1.9-68.0; p = 0.008). The sensitivity and specificity of diagnosing PCP with any two or more of these variables were 1.00 (95% CI 0.74-1.00) and 0.49 (95% CI 0.39-0.59), respectively. Diagnosing PCP with three or more of the indicators had a decreased sensitivity of 0.75 (95% CI 0.43-0.95) and increased specificity of 0.90 (95% CI 0.83-0.95). Conclusion: Empirical anti-pneumocystis therapy should be considered in HIV-infected infants presenting with tachypnea, hypoxia and absence of vomiting. copyright 2005 International Society for Infectious Diseases.

Fitch, K., S. Bernstein, et al. (2001). The RAND/UCLA appropriateness method user's manual. Santa Monica, CA, RAND.

Flanagan, P. S., N. J. MacKinnon, et al. (2004). "Validation of Four Clinical Indicators of

Preventable Drug-Related Morbidity." Annals of Pharmacotherapy **38**(1): 20-24.
BACKGROUND: Clinical indicators are tools that assess quality issues related to the use of medicines. At this time, validated clinical indicators for preventable drug-related morbidity (PDRM) are lacking. OBJECTIVE: To assess the validity and reliability of using population administrative claims data to identify the extent of PDRM in older adults in Canada. METHODS: Four indicators of PDRM related to cerebrovascular and cardiovascular care were chosen for validation. A random sample of cases that represented the indicators and fit the criteria (hits) for PDRM from the retrospective operationalization of the study database and those that did not fit the criteria (near hits) were selected for chart review. One-page abstracts of the cases were prepared for review by a panel of 5 clinical pharmacists. Validity was assessed by calculating sensitivity, specificity, and positive and negative predictive value. Reliability was assessed using reviewers' agreement scores (kappa statistics). RESULTS: Overall, 119 case abstracts were reviewed by each panelist. The sensitivity ranged from 33% to 100% and the specificity from 51% to 71%. Predictive values ranged from 5.3% to 43% (positive) and 90% to 100% (negative). The overall kappa statistic was fair (0.21). CONCLUSIONS: The validity of the 4 assessed PDRM indicators varied. The reliability was fair; however, these indicators may be useful to screen older adults for PDRM.

Frankenfield, D. L., B. F. Prowant, et al. (1999). "Trends in clinical indicators of care for adult peritoneal dialysis patients in the United States from 1995 to 1997." Kidney International **55**(5): 1998-2010.
Background. This article describes the changes in four core indicator variables: dialysis adequacy, hematocrit, serum albumin, and blood pressure in peritoneal dialysis CAPD and cycler patients over a three-year period. Methods. A national random sample of adult peritoneal dialysis patients in the United States was drawn each study period. Clinical data abstraction forms were completed by facility staff for patients selected for the sample, returned to the respective network, then forwarded to the Health Care Financing Administration for analysis. Results. The mean weekly Kt/V urea for CAPD patients increased from 1.91 in 1995 to 2.12 in 1997 (P < 0.001) and for cycler patients, from 2.12 in 1996 to 2.24 in 1997 (P < 0.05). The mean weekly creatinine clearance for CAPD patients increased from 61.48 liter/week/1.73 m² in 1995 to 65.84 liter/week/1.73 m² in 1997 (P < 0.05). For cycler patients, it increased from 63.37 liter/week/1.73 m² in 1996 to 67.45 liter/week/1.73 m² in 1997 (P < 0.05). Despite this increase in adequacy values, less than 40% of peritoneal dialysis patients in 1997 had weekly Kt/V urea or creatinine clearance values that met subsequently published National Kidney Foundation's Dialysis Outcomes Quality Initiative (DOQI) guidelines. These data suggest that the dialysis prescription may not be adequately modified to compensate for increased body weight and for decreased residual renal function as years on dialysis increase. The average hematocrit value increased modestly in both CAPD and cycler patients from 1995 to 1997, and the number of patients with a hematocrit of less than 25% decreased from 6% in 1995 to 1.4% in 1997 (P < 0.001). Both serum albumin values and systolic and diastolic blood pressure values were essentially unchanged during the three-year period of observation. Conclusions. Despite improvements in dialysis adequacy and hematocrit values, there remains much room for improvement in these core indicator values.

Fraser, W., M. Hatem-Asmar, et al. (2000). "Comparison of midwifery care to medical care in hospitals in the Quebec pilot projects study: Clinical indicators." Canadian Journal of Public Health **91**(1): I5-I11.
The purpose of this study was to compare indicators of process and outcome of midwifery services in the Quebec pilot projects to those associated with standard hospital-based medical services. Women receiving each type of care (961 per group) were matched on the basis of socio-demographic characteristics and level of obstetrical risk. We found midwifery care to be associated with less obstetrical intervention and a reduction in selected indicators of maternal morbidity (caesarean section and severe perineal injury). For neonatal outcome indicators, midwifery care was associated with a mixture of benefits and risks: fewer babies with preterm birth and low birthweight, but a trend toward a higher stillbirth ratio and more frequent requirement for neonatal resuscitation. The study design does not permit to conclude that the associations were causal in nature. However, the high stillbirth rate observed in the group of women who were selected for midwife care raises concerns both regarding the appropriateness of the screening procedures for admission to such care and regarding the

quality of care itself.

Fulmer, T. and J. Ashley (1989). "Clinical indicators of elder neglect." Applied Nursing Research **2**(4): 161-167.
An exploratory factor analysis was conducted to test the construct validity of items to an elder mistreatment assessment instrument that specifically related to neglect. The researchers hypothesized that certain commonly accepted neglect indicators would emerge in a meaningful pattern that could then assist clinicians in their assessment of neglect. Interrelationships among the items suggested that three constructs were measured by the neglect items: (a) nutritional deficits; (b) alterations in skin integrity; and (c) alterations in elimination.

Gaglani, M. J. and M. S. Edwards (1995). "Clinical indicators of childhood retropharyngeal abscess." American Journal of Emergency Medicine **13**(3): 333-336.
Retropharyngeal abscess is a rare but distinctive cause of airway obstruction in childhood. Early recognition permits emergent airway management and surgical drainage. Even when the presentation is insidious and does not include respiratory compromise, early clinical diagnosis of retropharyngeal cellulitis and appropriate medical treatment may halt progression to an abscess. Delay in the diagnosis and management of a retropharyngeal abscess may lead to potentially lethal complications involving vital structures. A case of an infant whose diagnosis of retropharyngeal abscess was delayed because of absence of respiratory compromise is reported. Relapse of retropharyngeal abscess despite surgical drainage and appropriate antibiotic treatment was a complication of infection in this patient. Clinical indicators providing an early diagnosis of retropharyngeal infection, and aspects of evaluation, management, and outcome, are discussed.

Gallagher, N. M. (1991). "Peritoneal dialysis: monitoring and evaluating therapy; review of clinical indicators and use of data collection tools." ANNA Journal **18**(3): 284-287.

Gaskin, C. J., A. P. O'Brien, et al. (2004). "Consumer notes clinical indicators: determining inter-rater reliability with multiple raters, nominal categories and several cases." Australian Journal of Advanced Nursing **21**(3): 14-19.
A method of determining inter-rater reliability when there are multiple raters, nominal rating categories and several cases is described and applied in the development of an instrument for auditing the ANZCMHN (1995) standards of practice for mental health nursing in New Zealand. Clinical statements (n=41) from the O'Brien et al (2002a, 2003) study, which reflected nursing behaviours contributing to the achievement of the standards of practice, were used to audit consumer files. During two Phases, the clinical indicator statements were refined and rules for judging the achievement of each statement from case note documentation were established. The resultant statements have adequate inter-rater reliability for the assessment of nursing practice with respect to the ANZCMHN (1995) standards of practice.

Gibberd, R., S. Hancock, et al. (2004). "Using indicators to quantify the potential to improve the quality of health care." Int J Qual Health Care **16**(suppl_1): i37-43.
Purpose. Although clinical indicators allow individual providers to monitor and improve their own performance and quality of care, another important role for the indicators is to provide comparative information across all providers. We show that the league table' approach is ineffective, and provide an alternative method that uses the comparative rates to quantify the potential for improvement at both the provider and the national level. Data sources. The methods are applied to English and Australian hospital clinical indicators. Methods. The key is to regard clinical indicators as screening tools that measure performance in one or more dimensions. All screening processes require explicit tests to determine whether the result should be classified as either positive (requires further investigation) or negative (requires continued monitoring). A clinical indicator will be defined as positive if any of the three following criteria are met: (1) large variation between all areas or hospitals, as defined by the 20th centile gains: requires improvement in the health care system; (2) large variation between strata (rural/urban, teaching/non-teaching, public/private, State): requires action in the relevant stratum; (3) outlier hospitals: requires quality improvement in the individual hospitals. Two techniques are used to determine whether any of the three criteria are positive:

(1) empirical Bayesian estimation to calculate shrunken' rates; and (2) use of the 20th centile to quantify the potential gains or improvement. Results. For 185 Australian indicators, 55 clinical indicators had system gains involving better outcomes for at least 1000 patients per indicator. Using a set of criteria and subjective judgement, we identified some key areas for quality improvement in Australia. Conclusion. Ranking of hospitals does not quantify the potential gains that could be achieved. Indicators that measure health care processes should be reported by quantifying the potential gains, thus encouraging action. Estimating the gains across many indicators allows priorities to be established, such as identifying the areas with the greatest potential for improvement. The main tasks are to then provide the tools and resources to tackle those areas with the most gains.

Gibberd, R., A. Pathmeswaran, et al. (2000). "Using clinical indicators to identify areas for quality improvement." Journal of Quality in Clinical Practice **20**(4): 136-144.
Clinical indicators (CI) are increasingly being used to assess the quality of health care being provided by physicians and hospitals. However, a standardised reporting format and a methodology to assess the utility of the CI data has not been developed. This paper provides the reporting format that has been developed for the clinical colleges. The results for four surgical indicators are used to illustrate how the CI data can determine the potential to improve the quality of care. Numerical estimates of the potential gains that could be made are calculated by: (i) determining the outcome if the current mean rate was shifted to the rate for the best 20% of hospitals and (ii) identifying units with unusual variation in rates and shifting their rate to the average. All four indicators reveal gains that could impact on health policy and clinical practice.

Gilmore, S. A., G. Robinson, et al. (1995). "Clinical indicators associated with unintentional weight loss and pressure ulcers in elderly residents of nursing facilities." Journal of the American Dietetic Association **95**(9): 984-992.
Objective: To monitor adults older than 65 years living in nursing facilities and who experience unintentional weight loss of more than 10% of actual body weight in 6 months or more than 5% in 1 month or who have stage II, III, or IV pressure ulcers. Subjects: We reviewed 290 medical records for unintentional weight loss and 265 for pressure ulcers. Design: Two data-collecting instruments were used: one for pressure ulcers and one for unintentional weight loss. Indicators for each instruments were selected to monitor clinical conditions that tend to be problem-prone areas for these two populations. Statistical analysis: Descriptive statistics were used to calculate the frequency of each indicator for each population. Results: Of the 24 indicators for unintentional weight loss, the 6 indicators present most often, in descending order, were reduced functional ability, intake of 50% or less of food served for the past 3 consecutive days, chewing problems, serum albumin level less than 35 g/L with normal hydration status, cholesterol level less than 4.1 mmol/L, and refusal of 50% or more of food replacement for the past 7 days. For the residents with pressure ulcers, the indicator present most often was serum albumin level less than 35 g/L with normal hydration status. The three highest intervention indicators were receives 1.2 g protein per kilogram of actual body weight, receives 120 mg or more of vitamin C daily, and receives 1 1/2 times the energy required based on goal body weight. When serum albumin level was documented in the medical record, it was a valid indicator for both diagnoses. Conclusions: Inappropriate dietary intake, disease, and disability place residents in nursing facilities at risk for malnutrition. Thus, it is important to obtain laboratory values when assessing elderly residents and determining their nutritional status.

Gladman, D. D. and V. T. Farewell (1999). "Progression in psoriatic arthritis: Role of time varying clinical indicators." Journal of Rheumatology **26**(11): 2409-2413.
Objective. We have shown that the presence of 5 or more effusions and high medication use at first clinic visit predicted clinical progression in patients with psoriatic arthritis (PsA), while a low erythrocyte sedimentation rate (ESR) was 'protective.' These clinical indicators will change over the course of a patient's disease. We investigated whether there is additional prognostic information available through monitoring these indicators at each clinic visit. Methods. A total of 365 patients with at least 2 followup visits at the PsA Clinic who did not have 10 or more damaged joints at first visit were included. Clinical assessments including the number of actively inflamed and damaged joints were carried out every 6-12 mo according to a standard protocol. The analysis used a generalized linear model that relates

the number of damaged joints that developed between consecutive clinic visits to the information available at the first of the 2 visits, and in which the information was added to a baseline model including the first visit variables previously shown to be important. Results. Single factor analysis suggested that the addition of functional class, number of actively inflamed joints, and Lansbury index provide prognostic information for subsequent damage. The final multivariate model includes time varying information on the number of actively inflamed joints, functional class, and current damage, as well as first visit information on prior medication as predictive of progression of damage, plus male sex and a low ESR at first visit as 'protective.' Conclusion. Time varying predictors for damage are important and should be monitored longitudinally in patients with PsA.

Gladman, D. D., V. T. Farewell, et al. (1995). "Clinical indicators of progression in psoriatic arthritis: Multivariate relative risk model." Journal of Rheumatology **22**(4): 675-679.
Objective. To identify markers for severe disease in psoriatic arthritis (PsA). Methods. Patients with PsA followed prospectively according to a standard protocol over 14 years were included. Clinical and laboratory assessments of both active inflammation and clinical damage were performed at 6-month intervals according to a standard protocol. The information was entered into a computer database. Progression in damage was defined as transitions between damage states based on the number of damaged joints. Both univariate and multivariate models were developed to identify predictors for progression of damage. Results. The best model available, based on patient characteristics at the time of being first seen in the psoriatic arthritis clinic suggests that a high number of effusions and of past medications predicts progression in damage, whereas a low sedimentation rate 'protects' from such progression. Conclusions. Evidence of significant inflammation at first visit predicts progression of damage in the future, suggesting that patients with PsA should be offered more aggressive treatment early in the course of their disease.

Glaser, G. H. and G. H. Glaser (1980). "Mechanisms of antiepileptic drug action: clinical indicators." Advances in Neurology **27**: 11-20.

Gnanadesigan, N. and C. H. Fung (2007). "Quality indicators for screening and prevention in vulnerable elders." Journal of the American Geriatrics Society **55**(S2): S417-23.

Goldney, R. D., L. J. Fisher, et al. (1998). "Quality improvement by use of clinical indicators in a psychiatric hospital." Australasian Psychiatry **6**(4): 191-193.

Greenes, D. S. and S. A. Schutzman (1999). "Clinical indicators of intracranial injury in head-injured infants." Pediatrics **104**(4 I): 861-867.
Objectives. 1) To determine whether clinical signs of brain injury are sensitive indicators of intracranial injury (ICI) in head-injured infants. 2) To determine whether radiographic imaging of otherwise asymptomatic infants with scalp hematoma is a useful means of detecting cases of ICI. 3) To determine whether head-injured infants without signs of brain injury or scalp hematoma may be safely managed without radiographic imaging. Methods. We performed a 1-year prospective study of all infants younger than 2 years of age presenting to a pediatric emergency department with head trauma. Data were collected on historical features, physical findings, radiographic findings, and hospital course. Follow-up telephone calls were made 2 weeks after discharge to assess for any late deterioration. Results. Of 608 study subjects, 30 (5%) had ICI; 12/92 (13%) infants 0 to 2 months of age had ICI, compared with 13/224 (6%) infants 3 to 11 months of age, and 5/292 (2%) infants 12 months of age or older. Only 16/30 (52%) subjects with ICI had at least one of the following clinical symptoms or signs of brain injury: loss of consciousness, history of behavior change, seizures, emesis, depressed mental status, irritability, bulging fontanel, focal neurologic findings, or vital signs indicating increased intracranial pressure. Of the 14 asymptomatic subjects with ICI, 13 (93%) had significant scalp hematoma. Among subjects who had head computed tomography, significant scalp hematoma had an odds ratio of 2.78 (95% confidence interval: 1.15,6.70) for association with ICI. A total of 265 subjects (43%) were asymptomatic and had no significant scalp hematoma. None (95% confidence interval: 0,1.2%) required specific therapy or had any subsequent clinical deterioration. Conclusions. Clinical signs of brain injury are insensitive indicators of ICI in infants. A substantial fraction of infants with ICI will be detected through radiographic imaging of otherwise asymptomatic infants with significant scalp hematomas. Asymptomatic

infants older than 3 months of age who have no significant scalp hematoma may be safely managed without radiographic imaging.

Grimmer, K. and M. Dibden (1993). "Clinical indicators for physiotherapists." Australian Journal of Physiotherapy **39**(2): 81-85.
Clinical indicators have recently been introduced into the Australian Council of Healthcare Standards (ACHS) Hospital Accreditation Programme. They offer a means of monitoring the process and outcome of care by determining flags of performance which are used for constant reassessment. This paper explores the benefits of developing clinical indicators specific to physiotherapy. It also identifies the steps preliminary to the development of indicators and gives examples of indicators currently being trialled by Australian physiotherapists. By taking the steps necessary to the development of indicators, physiotherapists in all types of practice will be in a better position to judge the effectiveness of their patient care.

Gross, B. A. (1989). "Clinical indicators of the fertile period." International Journal of Gynecology and Obstetrics **29**(SUPPL. 1): 45-51.

Gross, C. R., R. D. Lindquist, et al. (1992). "Clinical indicators of dehydration severity in elderly patients." Journal of Emergency Medicine **10**(3): 267-274.
Study Objective: To determine which of the signs and symptoms of dehydration obtainable from patient history and physical examination in the emergency department are most useful in assessing the severity of dehydration in elderly patients. Design: Prospective, correlational study. Setting: Two university teaching hospitals. Patients: Fifty-five patients aged 60 or older presenting to the emergency department with suspected dehydration were studied. Measurements and Main Results: In the emergency department, patients were evaluated by a standardized history and physical examination that included assessment of 38 signs and symptoms commonly attributed to dehydration. The relationships between the presence and intensity of these putative dehydration indicators and an independent rating of dehydration severity based on a comprehensive review of the medical record were evaluated. Also evaluated were the relationships between these dehydration indicators and patient age. Indicators that correlated best with dehydration severity but were unrelated to patient age included: tongue dryness ($P < 0.001$), longitudinal tongue furrows ($P < 0.001$), dryness of the mucous membranes of the mouth ($P < 0.001$), upper body muscle weakness ($P < 0.001$), confusion ($P < 0.001$), speech difficulty ($P < 0.01$), and sunkenness of eyes ($P < 0.01$). Other indicators had only weak associations with dehydration severity or were also related to age. Patient thirst was unrelated to dehydration severity. Conclusions: A set of signs and symptoms related to dehydration severity in elderly patients has been identified. These indicators may be more useful for evaluation of dehydration severity in the emergency department than other commonly used indicators.

Gross, P. A., B. I. Braun, et al. (2000). "Comparison of clinical indicators for performance measurement of health care quality: A cautionary note." British Journal of Clinical Governance **5**(4): 202-211.
The use of clinical performance data is increasing rapidly. Yet, substantial variation exists across indicators designed to measure the same clinical event. We compared indicators from several indicator measurement systems to determine the consistency of results. Five measurement systems with well-defined indicators were selected. They were applied to 24 hospitals. Indicators for mortality from coronary artery bypass graft surgery and mortality in the perioperative period were chosen from these measurement systems. Analyses results and concludes that it is faulty to assume that clinical indicators derived from different measurement systems will give the same rank order. Widespread demand for external release of outcome data from hospitals must be balanced by an educational effort about the factors that influence and potentially confound reported rates.

Grucza, R. A. and L. R. Goldberg (2007). "The comparative validity of 11 modern personality inventories: Predictions of behavioral acts, informant reports, and clinical indicators." Journal of Personality Assessment **89**(2): 167-187.
In science, multiple measures of the same constructs can be useful, but they are unlikely to all be equally valid indicators. In psychological assessment, the many popular personality

inventories available in the marketplace also may be useful, but their comparative validity has long remained unassessed. This is the first comprehensive comparison of 11 such multiscale instruments against each of three types of criteria: clusters of behavioral acts, descriptions by knowledgeable informants, and clinical indicators potentially associated with various types of psychopathology. Using 1,000 bootstrap resampling analyses from a sample of roughly 700 adult research participants, we assess the relative predictability of each criterion and the comparative validity of each inventory. Although there was a wide range of criterion predictability, most inventories exhibited quite similar cross-validities when averaged across all three types of criteria. On the other hand, there were important differences between inventories in their predictive capabilities for particular criteria. We discuss the factors that lead to differential validity across predictors and criteria. Copyright copyright 2007, Lawrence Erlbaum Associates, Inc.

Guerriere, M. (2005). "Determining the utility of public reporting - too early to judge." Healthcare Papers **6**(2): 62-67.

Gurer-Orhan, H., H. U. Sabir, et al. (2004). "Correlation between clinical indicators of lead poisoning and oxidative stress parameters in controls and lead-exposed workers." Toxicology **195**(2-3): 147-154.
The present study was undertaken to investigate the involvement of oxidative damage in lead-induced toxicity in humans and to enlighten whether oxidative stress indicators are correlated with the known indices of lead toxicity. For these purposes, selected oxidative stress parameters along with some clinical indices of lead poisoning were determined in blood of battery plant workers and control subjects. Workers had significantly increased erythrocyte malondialdehyde (MDA) levels, catalase and glucose-6-phosphate dehydrogenase (G6PD) activities, and decreased blood glutathione:glutathione disulfide ratio compared to the controls. Increased blood lead concentrations and zinc protoporphyrin (ZPP) levels, and decreased delta-aminolevulinic acid dehydratase (ALAD) activity were used as clinical indices of lead toxicity. Statistically significant correlation between oxidative stress parameters and clinical indices implies that disrupted prooxidant/antioxidant balance might contribute to lead-induced toxicity in erythrocytes. A significant correlation was found between ALAD activity and blood lead levels in human subjects. Similarly significant correlation between ALAD activity and erythrocyte MDA concentrations was shown. Present data indicates that ALAD can serve as a valuable biomarker of oxidative stress in lead-exposed hematological system as well as being a biochemical indicator of lead exposure.

Haller, G., J. Stoelwinder, et al. (2009). "Quality and safety indicators in anesthesia: a systematic review." Anesthesiology **110**(5): 1158-75.

Hamilton-Davies, C., M. G. Mythen, et al. (1997). "Comparison of commonly used clinical indicators of hypovolaemia with gastrointestinal tonometry." Intensive Care Medicine **23**(3): 276-281.
Objective: The gastrointestinal tonometer, which allows measurement of gastrointestinal mucosal CO₂ and subsequent derivation of gut intramucosal pH (pHi), has been demonstrated to be a sensitive predictor of outcome following major surgery. Current theory suggests that the origin of the low pH may be hypovolaemia. This study was designed to compare the temporal sequence of changes in tonometric readings with invasive blood pressure, stroke volume, heart rate, lactate and arterial blood gas measurements during progressive haemorrhage. Design: Observational healthy volunteer study. Setting: Intensive care unit at University College London Hospitals. Subjects: Six healthy, medically qualified volunteers. Interventions: After obtaining baseline measurements, the subjects were progressively bled 25% (range = 21-31%) of their blood volume over a period of 1 h in two approximately equal aliquots. Equilibration was allowed for 30 min following the bleed, after which further measurements were and the blood was then retransfused over 30 min. Measurements and main results: There was no consistent change in any of the haemodynamic variables other than gastric intramucosal CO₂: arterial CO₂ gap (PiCO₂- PaCO₂) after removal of the first aliquot of blood, although five of the six subjects also demonstrated a fall in pHi. After removal of the second aliquot of blood, PiCO₂ - PaCO₂ gap and pHi

continued to indicate a worsening gastric intramucosal acidosis; stroke volume, as measured by suprasternal Doppler, demonstrated a marked fall, while all other variables measured had not altered consistently or to such a degree as to elicit a clinical response or cause suspicion of a hypovolaemic state. On retransfusion, all variables returned towards baseline. Conclusions: This study demonstrates the value of tonometry as an early monitor of hypovolaemia and highlights the shortcomings of other more commonly measured clinical variables.

Harad, F. T. and M. D. Kerstein (1992). "Inadequacy of bedside clinical indicators in identifying significant intracranial injury in trauma patients." Journal of Trauma **32**(3): 359-363.
During 1987 and 1988, the trauma service at Hahnemann University Hospital, a level I trauma center, evaluated 1,875 consecutive patients. Four hundred ninety-seven consecutive computed tomographic (CT) scans were performed to evaluate intracranial trauma in the emergency department. These patients' records were reviewed to determine the adequacy of loss of consciousness, amnesia, Glasgow Coma Scale (GCS) score, and mechanism of injury in predicting intracranial findings. In 302 patients with a GCS score of 13 or greater, 55 (18%) CT scans showed abnormal findings. Eleven (4%) of these patients required neurosurgical intervention. Furthermore, patients with normal CT scans required no interventions for head trauma. Mechanism of injury directly influenced the incidence of neurosurgical intervention. Current bedside methods to evaluate patients for possible intracranial injury in our trauma patient population are inadequate. Emergency department CT scans should be performed on all patients referred to the trauma service with previously classified mild- or low-risk criteria for intracranial trauma, regardless of GCS score.

Harper, D. S., P. J. Robinson, et al. (1987). "Correlation of histometric, microbial, and clinical indicators of periodontal disease status before and after root planing." Journal of Clinical Periodontology **14**(4): 190-6.
Effective diagnosis and treatment of periodontal disease requires accurate evaluation of disease status before and after treatment. This study evaluated relationships among multiple parameters that have been used for periodontal disease evaluation. A total of 61 initially deep (greater than or equal to 6 mm) interproximal pockets from 16 patients examined before and after a 3-week course of root planing therapy were evaluated for probing depth, bleeding on probing, darkfield and cultural characterization of subgingival plaque, and histometric indices of infiltrated connective tissue (ICT) and mature plasma cell infiltrate. 36 sites were evaluated before treatment, and 25 after treatment. A comparison of mean scores for pre-treatment sites versus post-treatment sites indicated that there was an average improvement in most disease-related parameters. However, patterns of significant correlations among the parameters differed markedly. Motile bacteria enumerated by darkfield microscopy were significantly correlated with ICT and plasma-cell populations before, but not after treatment. In contrast, probing depth and populations of black pigmented Bacteroides (BPB's), principally B. gingivalis, were significantly correlated with ICT after, but not before, treatment. Bleeding on probing was not significantly correlated with ICT levels before or after treatment. This suggests that different sets of parameters should be used for evaluating periodontal disease status before or after treatment. Our data further suggest that B. gingivalis populations may be related to delayed healing of deep periodontal lesions after instrumentation.

Hartz, A. J., S. Kelber, et al. (1987). "The association of smoking with clinical indicators of altered sex steroids--a study of 50,145 women." Public Health Reports **102**(3): 254-9.
This study was designed to test the association of smoking with four clinically apparent conditions that may be related to altered sex steroids: natural and induced menopause, infertility, oligomenorrhea, and hirsutism. Data were obtained from the personal inventories of 50,145 women ages 20-59 years in TOPS, a weight reduction program. The age-adjusted odds ratios of each condition for heavy smokers compared with nonsmokers were 1.59 for natural menopause, 1.49 for induced menopause, 1.35 for infertility, 1.30 for oligomenorrhea among women younger than 40 years, 1.63 for oligomenorrhea among women 40-49 years, and 1.54 for hirsutism (P less than .05 for oligomenorrhea and P less than .001 for all other risks). The odds ratios were not substantially changed after adjustment for obesity, parity, and husband's education level. These results suggest that smoking may affect the ovaries or hormone metabolism, or both, with medical and cosmetic consequences.

Helmer, D. A., C. Tseng, et al. (2003). "Applying diabetes-related prevention quality indicators to a national cohort of veterans with diabetes." Diabetes Care **26**(11): 3017-3023.

Hickey, A., I. Scott, et al. (2004). "Using clinical indicators in a quality improvement programme targeting cardiac care." International Journal for Quality in Health Care **16**(SUPPL. 1): i11-i25.
Rationale. The Brisbane Cardiac Consortium, a quality improvement collaboration of clinicians from three hospitals and five divisions of general practice, developed and reported clinical indicators as measures of the quality of care received by patients with acute coronary syndromes or congestive heart failure. Development of indicators. An expert panel derived indicators that measured gaps between evidence and practice. Data collected from hospital records and general practice heart-check forms were used to calculate process and outcome indicators for each condition. Our indicators were reliable (kappa scores 0.7-1.0) and widely accepted by clinicians as having face validity. Independent review of indicator-failed, in-hospital cases revealed that, for 27 of 28 process indicators, clinically legitimate reasons for withholding specific interventions were found in <5% of cases. Implementation and results. Indicators were reported every 6 months in hospitals and every 10 months in general practice. To stimulate practice change, we fed back indicators in conjunction with an education programme, and provided, when requested, customized analyses to different user groups. Significant improvement was seen in 17 of 40 process indicators over the course of the project. Lessons learned and future plans. Lessons learnt included the need to: (i) ensure brevity and clarity of feedback formats; (ii) liberalize patient eligibility criteria for interventions in order to maximize sample size; (iii) limit the number of data items; (iv) balance effort of indicator validation with need for timely feedback; (v) utilize more economical methods of data collection and entry such as scannable forms; and (vi) minimize the burden of data verification and changes to indicator definitions. Indicator measurement is being continued and expanded to other public hospitals in the state, while divisions of general practice are exploring lower-cost methods of ongoing clinical audit. Conclusion. Use of clinical indicators succeeded in supporting clinicians to monitor practice standards and to realize change in systems of care and clinician behaviour. copyright International Society for Quality in Health Care and Oxford University Press 2004; all rights reserved.

Hindle, D., J. Braithwaite, et al. (2006). Patient safety: a comparative analysis of eight inquiries in six countries. Sydney, Centre for Clinical Governance Research in Health, University of NSW and Clinical Excellence Commission.

Hoffmann, R. P. and R. P. Hoffmann (1989). "JCAHO--clinical indicators--a glimpse into the future." Hospital Pharmacy **24**(1): 63-4.

Holmes, A. C. N., F. K. Judd, et al. (2000). "The development of clinical indicators for a consultation-liaison service." Australian and New Zealand Journal of Psychiatry **34**(3): 496-503.
Objective: The aim of this paper is to describe the development and implementation of clinical indicators in the consultation-liaison service at Royal Melbourne Hospital (RMH). Method: A working party lead by the University of Melbourne was established in 1998 to develop clinical indicators and a database for the RMH consultation-liaison service. Core parameters for measuring service functioning and six clinical indicators were developed. The system was implemented using a data collection form and computerised database operating within a system of regular clinical reviews. Results: The clinical indicators, database and review system were found to be a feasible, useful and efficient addition to a consultation-liaison service at a major general hospital. Conclusions: Clinical indicators may be used within specialist psychiatry services to enhance clinical care and aid in service development and teaching.

Holmes, A. C. N., F. K. Judd, et al. (2001). "A 12-month follow up of the implementation of clinical indicators in a consultation - Liaison service." Australian and New Zealand Journal of Psychiatry **35**(2): 236-239.
Objectives: This paper reviews the use of clinical indicators in a consultation-liaison (C-L) service over a 12-month period at the Royal Melbourne Hospital, Melbourne, Australia. Method: Clinical indicators and C-L data were collected during the 1999 calendar year. A

review of the process was conducted during and after completion of the 12-month period. Results: The system was found to be practical and useful. The use of clinical indicators led to the identification of problems and stimulated effective interventions. The use of the clinical indicators was associated with improvement in communication between C-L staff, parent units and practitioners providing follow-up. Conclusions: The implementation of a database and clinical indicators was a useful addition to the C-L service. The use of clinical indicators was effective in improving clinical performance. These benefits need to be balanced against increased administrative burden.

Holmes, S. (2007). "Patients with COPD are benefiting from the QOF clinical indicators." Guidelines in Practice **10**(11): 23.
Dr Steve Holmes discusses the clinical indicators for chronic obstructive pulmonary disease and how they are augmenting the already high level of care provided by GPs.

Horne, B. M. and W. A. Justiss (1967). "Clinical indicators of brain damage in mentally retarded children." Journal of Clinical Psychology **23**(4): 464-5.

Howley, P. P. and R. Gibberd (2003). "Using hierarchial models to analyse clinical indicators: A comparison of the gamma-Poisson and beta-binomial models." International Journal for Quality in Health Care **15**(4): 319-329.
Background. Clinical indicators (CIs) are used to assess, compare and determine the potential to improve the care provided by hospitals and physicians. The results for Australian hospitals in 1998-2000 have been reported using a new methodology. The gamma-Poisson hierarchical model was used to correct for the effects of sampling variation by obtaining the empirical Bayesian shrunken estimates for the CI proportions for each hospital. Then, an estimate of the potential system gains that could be achieved if the mean proportion was shifted to the 20th centile is obtained for each of the 185 CIs. The results are used to prioritize quality improvement activity. Objectives. To describe the 20th centile method of calculating potential system gains in the health care system; to determine the impact of using the beta-binomial model rather than the gamma-Poisson model to obtain shrunken estimates for the CI proportions; and to compare the computationally simpler Method of Moments (MoM) with the maximum likelihood (ML) method for parameter estimation. Methods. The formulae for the gamma-Poisson and beta-binomial shrinkage estimators were compared analytically. Each of the shrinkage estimators and the two methods of parameter estimation were applied to the Obstetric and Gynecological CIs, and the results compared. Results. The comparison of the formulae for the two shrinkage estimators showed that the gamma-Poisson model results in greater shrinkage towards the overall mean. This was verified empirically using the clinical indicators. Additionally, the MoM was not a viable alternative to the ML method. Conclusions. The gamma-Poisson model provided smaller estimates of the potential system gains by up to 6.7% of the numerator for the clinical indicators. The difference in estimation increased with increasing mean proportions and between-hospital variation. We recommend that the beta-binomial model should be used on the basis of both theoretical and empirical grounds.

Huang, M. C., A. Chao, et al. (2002). "Negligible changes in piglet serum clinical indicators or organ weights due to dietary single-cell long-chain polyunsaturated oils." Food and Chemical Toxicology **40**(4): 453-460.
Single-cell oils are currently included in human infant formula as sources of the long-chain polyunsaturates (LCP) docosahexaenoic acid (DHA) and arachidonic acid (AA) in many countries, but have not yet been approved for use in the USA. We prepared four bovine-milk-based formulas with AA/DHA = 0, 34/17, 68/34 and 170/85 (mg per 100 kcal formula) provided by two commercial single-cell oils. These levels correspond approximately to 0, 1, 2 and 5 times the concentrations used in infant formulas and, due to greater consumption of formula per unit body weight, resulted in daily consumption of approximately 0, 3, 6 and 16 times those anticipated for human infants. All other dietary fat (47% of calories) was provided by a vegetable oil blend used in commercial human infant formulas. Domestic piglets were allowed to nurse with the sow for 24 h after parturition, then removed to individual cages and maintained on one of the four diets. At 30 days of age the piglets were sacrificed, and serum collected and organs weighed. With litters treated as a blocked variable, no significant differences among groups were found by analysis of variance for the following serum assays: alkaline phosphatase, alanine aminotransferase (ALT), aspartate aminotransferase (AST),

blood urea nitrogen (BUN), creatinine, albumin, glucose, cholesterol, triglycerides, and total protein. No significant differences were found for hematocrit or body weight. No significant differences were found among groups for weights of liver, brain, heart, lung, spleen, kidneys or lung, analyzed as absolute weight and as a fraction of body weight. Hematoxylin/eosin liver sections examined by light microscopy showed no abnormalities as evaluated by an independent pathologist. DHA content in liver and heart and AA content in heart showed significant dose-related accumulation ($P < 0.05$) and confirmed enhanced tissue accretion of DHA and AA from both oils. We conclude that single-cell oils in formula consumed for 1 month in amounts up to 16-fold greater than proposed for human infants in the USA did not result in clinical chemistry or histopathologic indications of toxic effects in neonatal pigs.

Hunter, G. C. (2006). "Clinical indicators and psychosocial aspects in peripheral arterial disease - Invited critique." Archives of Surgery **141**(2): 166.

Idvall, E., L. Rooke, et al. (1997). "Quality indicators in clinical nursing: a review of the literature." Journal of Advanced Nursing **25**(1): 6-17.

Ingram, D. H. and D. H. Ingram (1983). "Clinical indicators of structural change." American Journal of Psychoanalysis **43**(1): 39-48.

Innes, K. (1998). "Letters to the editor... Matching ICD-9-CM codes to clinical indicators: is it the way to go? (HIM Journal, Vol 27 No.4 p165-170)." Health Information Management **28**(1): 4-5.

Italian Society of Otorhinolaringology and Cervicofacial Surgery (2002). "Clinical indicators for day hospital and day surgery managed otorhinolaryngologic and cervicofacial diseases." Acta Otorhinolaryngologica Italica **22**(5 Suppl 72): 1-13.

Jacobs, E. R., R. C. Bone, et al. (1986). "Clinical indicators in sepsis and septic adult respiratory distress syndrome." Medical Clinics of North America **70**(4): 921-32.
Sepsis and septic ARDS remain clinical problems of great significance because of the numbers of patients affected each year and the high mortality associated with development of the syndrome. The standard therapies for these conditions, judicious antibiotic administration and supportive care, continue to be the mainstays of treatment for these patients, but mortality even with optimal conventional therapy is between 50% and 90% for septic ARDS. The mortality for an individual patient may be anticipated to be substantially higher or lower than these average reported values, based on the presence or absence of several clearly identified risk factors, such as advanced age, shock, evidence of multiorgan system failure, and others discussed above. Similarly, the likelihood that the septic patient will develop ARDS is increased by the appearance of shock and thrombocytopenia. Two therapies that are used extensively in the intensive care unit today--corticosteroid administration and PEEP--have not been shown to reduce the overall mortality of sepsis or septic ARDS. Newer therapeutic modalities, designed to protect against or reverse cardiovascular consequences of sepsis, reduce the incidence of multiorgan system failure, and diminish the high incidence of uncontrolled infections in these patients, are needed; investigations of these interventions are in progress. [References: 46]

Jones, J. J. and D. Koldjeski (1984). "Clinical indicators of a developmental process in phlebitis." NITA: Journal of the National Intravenous Therapy Association **7**(4): 279-285.

Kal'nyn'sh, I. and L. L. Fridenberg (1977). "Effect of health resort treatment on the clinical indicators and dynamics of blood serum protein fractions in patients with a history of spinal cord injury." Voprosy Kurortologii, Fizioterapii i Lechebnoi Fizicheskoi Kultury(5): 57-61.

Kjaergaard, J., L. P. Jensen, et al. (2002). "Clinical indicators and quality databases--a review." Ugeskrift for Laeger **164**(38): 4392-8.
This review states the work which has been done in Denmark on clinical indicators and large databases containing clinical data with nationwide coverage. The aim of the work was to obtain valid and reliable information on clinical quality to be used by clinicians, leaders, and

the public. Nationally we have: 1) The needed experience related to identification and development of clinical indicators and construction of databases. 2) The necessary partners (scientific societies, hospital owners, primary care sector, and health authorities) are motivated and involved in a collaborative organisation. Nationally we lack: 1) Experience with implementation and use of clinical indicators. 2) An overview of the needed investments to ensure coverage of all important diseases, continuity in patient care, and improvement of the existing databases. 3) Fully integrated information systems. [References: 31]

Kotsanas, D., R. L. Stuart, et al. (2008). "Constructing clinical indicators for multiresistant organisms. Where do we begin?" Healthcare Infection **13**(1): 15-19.
Multidrug-resistant organisms (MROs) are a significant and growing concern in many healthcare facilities. Resistant organisms can be rapidly transmitted, have limited antimicrobial treatment options, are capable of significant morbidity and mortality, and are associated with longer hospital stays and greater overall costs. Clinical indicators can be used to identify environments that may benefit from closer monitoring. Specific indicators for Southern Health, the largest metropolitan health service in Victoria, were constructed using the methodology developed by the Australian Infection Control Association. Organisms monitored were methicillin-resistant Staphylococcus aureus, vancomycin-resistant enterococci, Gram-negative bacilli (Pseudomonas spp., Acinetobacter spp., Serratia marcescens) and Clostridium difficile. Rate-based graphs were constructed to provide a display of changes to the prevalence of MROs. Denominator data (occupied bed days) were easily obtained from the health services clinical information system. Continuous monitoring using clinical indicators allows the infection control team to identify areas that may benefit from enhanced unit activity and allows a framework to be constructed for the ongoing development of quality indicators in infection control. Suitable statistical charts that provide 95% confidence intervals and flag MRO levels requiring action are currently under investigation.

Kramers, P. G. N. (2003). "The ECHI project: Health indicators for the European Community." Eur J Public Health **13**(suppl_1): 101-106.
Background: Within the EU Health Monitoring Programme (HMP), the ECHI project has proposed a comprehensive list of European Community Health Indicators'. Methods: In the design of the indicator set, a set of explicit criteria was applied. These included: i) be comprehensive and coherent, i.e. cover all domains of the public health field; ii) take account of earlier work, especially that by WHO-Europe, OECD and Eurostat; and iii) cover the priority areas that Member States and Community health policies currently pursue. Flexibility is an important characteristic of the present proposal. In ECHI, this has been emphasized by the definition of user-windows'. These are subsets from the overall indicator list, each of which should reflect a specific user's requirement or interest. Results: The proposed indicators are, in most cases, defined as generic indicators, i.e. their actual operational definitions have not yet been attempted. This work has been, and is being carried out to a large part by other projects financed under the HMP, which cover specific areas of public health or areas of data collection. Apart from indicators covered by regularly available data, indicators (or issues) have been proposed for which data are currently difficult to collect but which from a policy point of view would be needed. Conclusion: All this points to the fact that establishing an indicator list which is actually used by Member States is a continuously developing process. This process is now continued by the first strand of the new EU Public Health Action Programme.

Kristensen, S., J. Mainz, et al. (2009). "Selection of indicators for continuous monitoring of patient safety: recommendations of the project 'safety improvement for patients in Europe'." Int J Qual Health Care **21**(3): 169-175.
BackgroundInitiatives to improve patient safety have high priority among health professionals and politicians in most developed countries. Currently, however, assessment of patient safety problems relies mainly on case-based methodologies. The evidence for their efficiency and reproducibility, proving that safety of care has improved with their usage, is questionable. The exact incidence and prevalence of patient safety quality problems are unknown. Therefore, there is a need for firm, evidence-based methods to survey and develop patient safety and derived activities. ObjectivesThe objective of this paper is to describe a method to select patient safety indicators and present the indicators derived through this process. MethodsThe

patient safety indicators were derived and recommended for use in a formalized consensus process based on literature review, targeted information gathering, expert consultation and rating procedures. ResultsA total of 42 indicators, of which 28 originated from existing international indicator programmes, were selected. The processes and outcome indicators that were recommended for institutional-level use in Europe were 24, covering safety of care aspects such as culture, infections, surgical complications, medication errors, obstetrics, falls and specific diagnostic areas. ConclusionThe patient safety indicators recommended present a set of possible measures of patient safety. One of the future perspectives of implementing patient safety indicators for systematic monitoring is that it will be possible to continuously estimate the prevalence and incidence of patient safety quality problems. The lesson learnt from quality improvement is that it will pay off in terms of improving patient safety.

Kupfer, D. J., D. G. Spiker, et al. (1981). "Refractory depression: prediction of non-response by clinical indicators." Journal of Clinical Psychiatry **42**(8): 307-12.
The prediction of non-response in a well-defined group of 76 inpatients with a major depressive syndrome was made on the basis of clinical data. While agitation, anxiety, presence of delusions and bipolarity were significant factors, previously considered predictors (e.g. endogenous subtype, duration of present episode, number of previous episodes) did not contribute to the successful discrimination of response in this group at three levels: Clear-cut response, partial response and non-response. Since this investigation has carefully controlled for drug withdrawal and washout phases, medical complications and antidepressant drug compliance, the results of earlier studies may need to be reevaluated.

Kushner, R. F., E. A. Ayello, et al. (1994). "National Coordinating Committee clinical indicators of nutrition care." Journal of the American Dietetic Association **94**(10): 1168-1177.

Lah, T., M. Cercek, et al. (2000). "Cathepsin B, a prognostic indicator in lymph node-negative breast carcinoma patients: Comparison with cathepsin D, cathepsin L, and other clinical indicators." Clinical Cancer Research **6**(2): 578-584.
New prognosticators are needed for breast cancer patients after the initial surgical treatment to make therapeutic decisions that ultimately will affect their DFS. These consist of specific proteolytic enzymes including lysosomal endopeptidases. In this study, the activity and protein concentrations of cathepsins (Cats) D, B, and L were measured in 282 invasive breast tumor cytosols. These potential biological prognostic indicators were compared with other histopathological parameters, such as tumor size, lymph node involvement, tumor-node-metastasis stage, histological grade, DNA analysis, and steroid receptors. CatD protein concentration correlated with lymph node involvement. CatB and CatL levels correlated significantly with Scarf-Bloom-Richardson histological grade and were also higher in estrogen- negative tumors, and CatB was higher in larger tumors. As prognostic markers, CatB concentration was significant for increased risk for recurrence in the entire patient population and specifically also in lymph node-negative patients as follows: high CatB concentration (above 371 mug/g) in tumor cytosols was significant ($P < 0.00$) for high risk of recurrence but was of only borderline prognostic significance ($P < 0.06$) for overall survival of all patients. In lymph node-negative patients, CatB (above 240 mug/g, $P < 0.003$) was highly significant for recurrence-free survival, followed by CatL (above 20 mug/g, $P < 0.049$) and CatD (above 45 nmol/g, $P < 0.044$) concentrations. For overall survival of node-negative patients, only CatB was a significant ($P < 0.014$) prognosticator. We conclude that CatB is useful as a prognostic indicator in lymph node-negative patients. This suggests that selective adjuvant therapy should be applied in this lower risk group of patients when high levels of CatB are determined.

Landon, B. E., M. B. Rosenthal, et al. (2008). "Quality monitoring and management in commercial health plans." American Journal of Managed Care **14**(6): 377-386.

Lau, L. L. (2001). "Anaesthetic clinical indicators in public hospitals providing anaesthetic care in Hong Kong: Prospective study." Hong Kong Medical Journal **7**(3): 251-260.
Objectives. To assess the quality of anaesthetic services as defined in the six anaesthetic clinical indicators against preset standards and to identify risk factors for adverse events in the recovery room. Design. Prospective study. Setting. All public hospitals providing anaesthetic care in Hong Kong. Patients. Eighteen thousand, seven hundred and fifty-nine

patients receiving elective or emergency anaesthesia administered by anaesthetists from June 1998 to July 1998. Main outcome measures. Patient demographics, American Society of Anesthesiologists status, category and nature of operation, presence of preoperative anaesthetic visit in ward, type of anaesthesia, reasons for a recovery room stay of more than a 2-hour duration, intubation to relieve respiratory distress in the recovery room, presence of hypothermia in the recovery room for operations lasting more than 2 hours, and dental or ocular injuries attributable to anaesthesia. Results. There are two major findings from this study. Firstly, a high incidence of hypothermia in the recovery room was reported. Secondly, a greater risk of prolonged stay in the recovery room was identified for patients older than 65 years, major operations, and anaesthetic techniques using combined general and regional anaesthesia. Conclusion. The six anaesthetic clinical indicators reflected the provision of anaesthetic care in public hospitals in Hong Kong. Good compliance to the preset standard of the anaesthetic clinical indicators was achieved during the study period.

Lebedev, V. N., T. P. Markova, et al. (1987). "Immunologic and clinical indicators in patients with lymphocytic leukemia after administration of T-activin." Gematologiia i Transfuziologiia **32**(6): 30-4.

Levy, C. R., T. Eilertsen, et al. (2006). "Which Clinical Indicators and Resident Characteristics Are Associated With Health Care Practitioner Nursing Home Visits or Hospital Transfer for Urinary Tract Infections?" Journal of the American Medical Directors Association **7**(8): 493-498.
Objectives: (1) To determine factors associated with practitioner visitation and/or hospital transfer for skilled nursing facility (SNF) patients who develop a urinary tract infection (UTI) and (2) to determine if SNF patients with a Do Not Resuscitate (DNR) directive are less likely to be personally assessed and/or transferred to the hospital in the event of a UTI when compared to patients without a DNR directive. Design: Retrospective cohort study using nursing home medical record review. Participants: Participants were 564 residents from 35 nursing homes in 3 states who became acutely ill with UTI during the first 90 days of their nursing home admission. They were identified from 2832 random nursing home Medicare admissions and divided into 2 groups, those with DNR directives (n = 334) and those without (n = 230). Measurements: Logistic regression was used to determine factors associated with practitioner in-person assessment and/or hospitalization, and to determine differences in the likelihood of practitioner in-person assessment and/or hospitalization among those with DNR directives versus those without DNR directives. Results: Only one third (29%) of patients with unstable vital signs were seen by a practitioner or transferred to a hospital. Factors associated with practitioner assessment or hospital transfer were elevated temperature (OR 1.7, CI 1.04-2.64), pulse more than 100 beats per minute (OR 1.7, CI 1.01-2.99), and delirium (OR 2.1, CI 1.267-3.44). White residents were less likely to be assessed by a practitioner or transferred to a hospital (OR 0.45, CI 0.22-0.95). DNR directives were not significantly associated with fewer in-person assessments (P = .067). Conclusion: Only one third of SNF patients who developed a UTI with unstable vital signs were personally assessed by a practitioner and/or hospitalized. Patients with delirium were twice as likely to be assessed or transferred to a hospital, suggesting that practitioners use delirium as an indicator of illness severity. However, practitioner visit or transfer was also associated with ethnic background. In the absence of good evidence regarding which nursing home residents are likely to benefit from hospitalization or an urgent practitioner visit, these care decisions will continue to be associated with factors that are unknown. copyright 2006 American Medical Directors Association.

Levy, M. L., O. Van Schayck, et al. (2000). "Clinical indicators for asthma in primary care: A Pan-European clinical outcome project." Asthma in General Practice **9**(2 SUPPL.): S4-S5.
A meeting was convened by the Primary Care and General Practice Scientific Group (PCGPG) of the European Respiratory Society, at the recent General Practice Airways Group (GPIAG) International Respiratory Conference. Doctors from nine countries met to discuss the development of goals and indicators for asthma in primary care. They intend to proceed with this work using a model based on the development of indicators by the World Health Organization (WHO), in association with the International Diabetes Federation when they made the St Vincent Declaration (SVD), which set out a number of clinical outcome targets and indicators for diabetes. This work will be done over the internet by email, using the Delphi

technique.

Lewis, D. K., R. P. H. Peters, et al. (2002). "Clinical indicators of mycobacteraemia in adults admitted to hospital in Blantyre, Malawi." International Journal of Tuberculosis and Lung Disease **6**(12): 1067-1074.
SETTING: Adult medical wards of a central hospital in Blantyre, Malawi. OBJECTIVE: To measure the prevalence and outcome of mycobacteraemia in febrile hospitalised adults, and to determine what proportion could be identified using routine methods; to assess clinical indicators of mycobacteraemia, and the usefulness of a diagnostic trial of anti-tuberculosis treatment. DESIGN: We prospectively examined adults admitted with fever or a history of fever. All had blood cultured for bacteria and mycobacteria, chest X-ray and sputum smears. FINDINGS: Mycobacterium tuberculosis was the commonest cause of blood stream infection (BSI), affecting 57 of 344 patients (17%). In 44 (77%) patients with mycobacteraemia, TB was identified using routine investigations; it was not suspected in six (11%). Strong clinical indicators of mycobacteraemia were anaemia, HIV seropositivity, cough, chronic fever and a clinical diagnosis of AIDS on the day of admission. Of nine patients selected for a therapeutic trial of tuberculosis (TB) treatment, six had mycobacteraemia, of whom five died during the trial. Mortality on short-course chemotherapy, on the TB ward after 1 month was similar whether patients had mycobacteremia (21%) or not (32%). CONCLUSION: TB can be identified with routine methods in most patients with mycobacteraemia. If treated, mycobacteraemia has as good an early outcome as TB without mycobacteraemia. Strengthening of basic facilities is likely to improve detection and treatment of mycobacterial disease.

Lindsay, P., M. Schull, et al. (2002). "The development of indicators to measure the quality of clinical care in emergency departments following a Modified-Delphi approach." Academic Emergency Medicine **9**(11): 1131-1139.

Loh, P. K., A. Criddle, et al. (2001). "Using non-geriatric clinical indicators in a department of rehabilitation and aged care." Australian Health Review **24**(4): 175-180.
We describe an audit using Gastroenterology Clinical Indicators (CIs) to measure quality of care for older patients with gastrointestinal haemorrhage. The gastroenterology CI for gastroscopy within 24 hours of admission was 60%, it was 70% for diagnosis of a cause of acute gastrointestinal bleeding after upper gastroscopy, and it was 30% for death after blood transfusion in a geriatric restorative unit. We discuss whether it is appropriate for a hospital department (Geriatric Medicine) to use the CIs for the specialty (Gastroenterology) providing the service to measure the quality of service being provided. This may be a useful approach given the trend towards cost recouping between different clinical departments.

Loh, P. K. and M. Donaldson (2000). "Improving clinical indicators in acute admissions to the Dept of Geriatric Medicine, Royal Perth Hospital." Australian Health Review **23**(2): 169-176.
Clinical indicators are an important component of quality assessment of clinical services. We outline the strategies used in the department of Geriatric Medicine at Royal Perth Hospital (RPH) to report on and improve the results. The clinical indicator for assessment of cognitive function had improved from 19% in September 1998 to 64% in February 1999. The clinical indicator for assessment of physical function has been maintained at 80%. There have been revisions to the definitions of the clinical indicators for 1999. The current clinical indicators used in this department can be modified for comparison nationwide amongst geriatric units.

Lohr, K. N., Ed. (1990). Medicare: a strategy for quality assurance. Washington, DC, National Academy Press.

Longworth, L., M. J. Buxton, et al. (2005). "Estimating utility data from clinical indicators for patients with stable angina." European Journal of Health Economics **6**(4): 347-353.
This study estimated a model from which data routinely collected in clinical trials of angina patients can be mapped to a utility scale and used to estimate quality-adjusted life years (QALYs). Patients with stable angina attending four cardiac out-patient clinics in the UK were included in the study. Data collected included information on patients' health-related quality of life (HRQL) using the EQ-5D, and severity of angina symptoms using two cardiac-specific measures [Breathlessness Grade and Canadian Cardiovascular Society (CCS) classification

of angina]. Regression analysis was used to predict EQ-5D index values from the data. Data were obtained from 510 patients. For CCS grades, mean EQ-5D scores ranged from 0.36 (95% confidence interval 0.25-0.48) for grade 4 to 0.81 (0.77-0.85) for grade 0, and for breathlessness grades, EQ-5D scores ranged from 0.31 (0.06-0.55) for grade 0 to 0.84 (0.79-0.88) for grade 5. The final model used data on CCS grades, breathlessness grades, and patients' current medications to predict EQ-5D scores.The model had an R ² value of 0.37, and predictions for less severe angina were considered more reliable than the estimates for severe angina. In the absence of utility data collected as part of a clinical trial it is possible to map HRQL utility data from samples of patients with similar characteristics to those in the original trial. The uncertainty surrounding the estimates should be considered when using the results to estimate QALYs for purposes of economic evaluation. copyright Springer Medizin Verlag 2005.

Lunsford, B. R. and B. R. Lunsford (1978). "Clinical indicators of endurance." Physical Therapy **58**(6): 704-9.

MacKinnon, N. J., N. R. Hartnell, et al. (2008). "Development of clinical indicators for type 2 diabetes." Canadian Pharmacists Journal **141**(2): 120-128.
Background/Objective: Preventable drug-related morbidity in patients with type 2 diabetes is a major concern. Our objective was to develop a set of Canadian clinical indicators of preventable drug-related morbidity (PDRM) and preventable care-related morbidity (PCRM) for type 2 diabetes. Methods: Each study partner (Dalhousie University, Nova Scotia Department of Health, Diabetes Care Program of Nova Scotia, and Sobeys Pharmacy Group) was asked to identify the priorities of medication-related diabetes care from the Canadian Diabetes Association 2003 clinical practice guidelines using the nominal group technique. Based on the priorities identified, a survey was constructed listing the clinical outcome and pattern of care related to a number of possible PDRMs/PCRMs in patients with type 2 diabetes. Using the Delphi technique, an interdisciplinary panel of 10 experts scored each clinical indicator in an attempt to achieve consensus. Results: Education/reinforcement of targets was identified by the nominal group technique as the most important area in which to improve diabetes care. After 3 rounds of the Delphi technique, 21 consensus-based clinical indicators were generated. Nine indicators were on the initial survey in round 1, and 12 indicators were suggested by the expert panel in rounds 1 and 2. Discussion: The resulting 21 clinical indicators provide clinicians and decision-makers with valuable tools to measure the quality of medication use in patients with type 2 diabetes.

Mainz, J. (2003). "Defining and classifying clinical indicators for quality improvement." International Journal for Quality in Health Care **15**(6): 523-530.

Mainz, J., P. D. Bartels, et al. (2001). "The National Indicator Project to monitoring and improving of the medical technical care." Ugeskr Laeger **163**: 6401-6406.

Mainz, J., B. R. Krog, et al. (2004). "Nationwide continuous quality improvement using clinical indicators: The Danish National Indicator Project." International Journal for Quality in Health Care **16**(SUPPL. 1): i45-i50.
Objective. In most countries there is no mandatory national system to track the quality of care delivered to the citizens. This paper describes an example of a national indicator project'that aims at documenting and improving the quality of care nationwide. Analysis. The Danish National Indicator Project was established in 2000 as a nationwide multidisciplinary quality improvement project. From 2000 to 2002, disease-specific clinical indicators and standards were developed for six diseases (stroke, hip fracture, schizophrenia, acute gastrointestinal surgery, heart failure, and lung cancer). Indicators and standards have been implemented in all clinical units and departments in Denmark treating patients with the six diseases, and participation is mandatory. All clinical units and departments receive their results every month. National and regional audit processes are organized to explain the results and to prepare implementation of improvements. All results are published in order to inform the public, and to give patients and relatives the opportunity to make informed choices. Conclusion. The surveillance of health care quality is greatly aided by the use of relevant quantitative indicators. This paper describes how it is possible to organize nationwide monitoring using clinical indicators.

Mainz, J. and J. Mainz (2003). "Defining and classifying clinical indicators for quality improvement." International Journal for Quality in Health Care **15**(6): 523-30.
OBJECTIVE: This paper provides a brief review of definitions, characteristics, and categories of clinical indicators for quality improvement in health care. ANALYSIS: Clinical indicators assess particular health structures, processes, and outcomes. They can be rate- or mean-based, providing a quantitative basis for quality improvement, or sentinel, identifying incidents of care that trigger further investigation. They can assess aspects of the structure, process, or outcome of health care. Furthermore, indicators can be generic measures that are relevant for most patients or disease-specific, expressing the quality of care for patients with specific diagnoses. CONCLUSIONS: Monitoring health care quality is impossible without the use of clinical indicators. They create the basis for quality improvement and prioritization in the health care system. To ensure that reliable and valid clinical indicators are used, they must be designed, defined, and implemented with scientific rigour.

Mainz, J. and J. Mainz (2003). "Developing evidence-based clinical indicators: a state of the art methods primer." International Journal for Quality in Health Care **15 Suppl 1**: i5-11.
OBJECTIVE: To describe steps in developing and testing clinical indicators based on state of the art methods in previous literature and experience in the Danish National Indicator Project. ANALYSIS: The development process includes a planning phase, where the clinical area to be evaluated is chosen and the measurement team selected and organized. The planning phase is followed by a development phase where clinical indicators are prioritized and selected by the measurement team on the basis of documentation and knowledge from the scientific literature. When clinical indicators have been selected, specific measure specifications should be designed, including inclusion and exclusion criteria for the target population, description of a risk adjustment strategy, identification of data sources, description of data collection procedures, and an analytical plan for data analyses. Before clinical indicators are implemented they should be tested for reliability and validity. Preliminary tests may identify areas requiring further modifications and specifications of the indicators. CONCLUSION: Using clinical indicators for quality assessment represents an important approach to documenting the quality of care. Consumers of indicator information (clinicians, administrators, purchasers, regulators, and patients) need reliable and valid information for benchmarking, making judgments, and determining priorities, accountability and quality improvement. This underlines the fact that clinical indicators must be developed and tested with scientific rigor in a transparent process.

Mair, N. and N. Mair (1997). "A project management strategy for collection and reporting of casemix profiles and hospital clinical indicators." Health Information Management **27**(3): 109-15.
A newly developed strategy and computerised system for collection and reporting of hospital clinical indicators and doctor activity. A project was developed to analyse, plan and implement a data management strategy for Australian Council on Healthcare Standards (ACHS) clinical indicators. This project incorporated objectives for review of all available clinical indicators, analysis of appropriate medical and surgical clinical indicators, review and redesign of data collection methods, and feed-back processes suitable for hospital staff and visiting medical specialists. In conjunction with a software vendor, the hospital developed a computerised system for collection and reporting of clinical indicators. In addition to this, the system extracts data from the hospital's main database, to provide doctors with information regarding their own patient cases (doctor profiles), overview of activities of their specialty (specialty profiles) and casemix analysis.

Majoor, J. W., J. E. Ibrahim, et al. (1999). "The extraction of quality-of-care clinical indicators from State health department administrative databases." Medical Journal of Australia **170**(9): 420-424.
Objective: To assess whether three proposed quality-of-care indicators (unplanned readmissions, hospital-acquired bacteraemia, and postoperative wound infection) can be accurately identified from State health department databases. Design: Algorithms were applied to State health department databases to maximise the identification of individuals potentially positive for each indicator. Records of these patients were then examined to determine the percentage of cases that met the precise indicator definitions. Setting: 10

public, acute-care hospitals from Victoria, South Australia and New South Wales. Data from the 1994-95 and 1995-96 financial years were collected. Participants: Individuals 18 years of age or older who were identified from State health department administrative databases as potentially meeting the indicator criteria. Main outcome measures: The proportion of screened cases that met the precise indicator definitions, and the elements of the indicator definitions which could not be extracted from the administrative databases. Results: The proportions of cases confirmed by medical record review to be positive for the indicator events were 76.3% for unplanned readmissions within 28 days, 20% for hospital-acquired bacteraemia, 43.5% for wound infections after clean surgery, and 34.8% for wound infections after contaminated surgery. The clinical elements of each indicator definition were not easily extracted from the administrative databases. Conclusions: The three proposed clinical indicators could not be extracted from current State health department databases without an extensive process of secondary medical record review. If administrative databases are to be used for assessing quality of care, more systematic recording of data is needed.

Mamadaliev, A. M., A. R. Shakhnovich, et al. (1988). "Informative value of clinical indicators for predicting lethal and favourable outcome during the first 24 hours after a craniocerebral trauma." Zhurnal Nevropatologii i Psikhiatrii Imeni S.S.Korsakova **88**(5): 3-7.

Marder, R. J. (1990). "Relationship of clinical indicators and practice guidelines." Quality Review Bulletin **16**(2): 60.

Marder, R. J. and R. J. Marder (1990). "Relationship of clinical indicators and practice guidelines." Qrb Quality Review Bulletin **16**(2): 60.

Markiewicz, M., J. Dubejko, et al. (1984). "Composition of plasma lipoproteins and clinical indicators of the progression of arteriosclerosis in patients with primary hyperlipoproteinemia and different degrees of lipid change in the soft palate." Wiadomosci Lekarskie **37**(11): 831-5.

Mattke, S., A. M. Epstein, et al. (2006). "The OECD Health Care Quality Indicators Project: history and background." Int J Qual Health Care **18**(suppl_1): 1-4.
Objective. To describe the background, history, and approach of the OECD Health Care Quality Indicators (HCQI) Project, an initiative to implement quality measures for international benchmarking of medical care at the health system level. Method. The participating countries and international organizations selected five priority areas (cardiac care, diabetes, mental health, patient safety, and primary care/prevention) and developed a conceptual framework to guide the project. International expert panels were formed to identify clinically important, scientifically sound, and feasible measures based on a structured consensus process. Results. The consensus process was successfully completed in all five priority areas leading to a recommendation of 86 indicators. Nine indicators were selected for diabetes, 12 for mental health, 17 for cardiac care, 21 for patient safety, and 27 for primary care and prevention. Conclusions. The initial experience of the HCQI Project demonstrates that international consensus can be achieved in how to measure the quality of care in priority areas, suggesting substantial demand for and interest in comparative information at the health system level. However, much additional work remains necessary before the project can supply policymakers and researchers with ongoing, comprehensive, and reliable data on the quality of care in industrialized countries.

McConchie, S., J. Shepheard, et al. (2009). "The AusPSIs: the Australian version of the Agency of Healthcare Research and Quality patient safety indicators." Australian Health Review **33**(2): 334-350.

McCormick, B. and B. McCormick (1990). "Outcomes in action: the JCAHO's clinical indicators." Hospitals **64**(19): 34.

Mcloughlin, V., S. Leatherman, et al. (2001). "Improving performance using indicators. Recent experiences in the United States, the United Kingdom, and Australia." Int J Qual Health Care **13**(6): 455-462.
This article describes recent national performance improvement initiatives in the United States, United Kingdom, and Australia. This comparison is of particular interest because each

of these three countries faces similar challenges in delivering health care and improving health. Each has elevated a focus on safety and quality improvement to a national level. Marked differences in the organization and financing of health care across these three countries provide a unique opportunity to compare and contrast approaches. Drawing on the experience of the authors in each of the three countries and publicly available data sources about specific national initiatives, we describe the national context for improvement and outline recent performance improvement initiatives and emerging issues and challenges. Similarities and differences in the current evolution of national performance initiatives are described and conclusions are drawn about challenges that all three countries face, particularly in terms of developing meaningful sets of national indicators of health system performance. The challenges for future work include the importance of information infrastructure, the paucity of accurate and accessible clinical data, the need for effective performance measurement processes at a local level to capture useful data, and the tensions of balancing accountability and improvement agendas for measurement.

McLoughlin, V., J. Millar, et al. (2006). "Selecting indicators for patient safety at the health system level in OECD countries." Int J Qual Health Care **18**(suppl_1): 14-20.
Background. Concerns about patient safety have arisen with growing documentation of the extent and nature of harm. Yet there are no robust and meaningful data that can be used internationally to assess the extent of the problem and considerable methodological difficulties. Purpose. This article describes a project undertaken as part of the Organization for Economic Cooperation and Development (OECD) Quality Indicator Project, which aimed at developing an initial set of patient safety indicators. Methods. Patient safety indicators from OECD countries were identified and then rated against three principal criteria: importance to patient safety, scientific soundness, and potential feasibility. Although some countries are developing multi-source monitoring systems, these are not yet mature enough for international exchange. This project reviewed routine data collections as a starting point. Results. Of an initial set of 59 candidate indicators identified, 21 were selected which cover known areas of harm to patients. Conclusions. This project is an important initial step towards defining a usable set of patient safety indicators that will allow comparisons to be made internationally and will support mutual learning and quality improvement in health care. Measures of harm should be complemented over time with measures of effective improvement factors.

Miller, T. W. and L. J. Veltkamp (1993). "Family violence: Clinical indicators among military and post-military personnel." Military Medicine **158**(12): 766-771.
Child and spouse abuse continues to be a critically important problem for the medical and mental health professions. Examined are recent clinical data and research addressing this most serious concern among military and post- military personnel. Criteria useful in the identification of risk persons and diagnosis and treatment of family violence are discussed. Specific attention is given to the diagnostic indicators, the abusing family profile, the traumatic process of abuse, and strategies relevant to psychiatric intervention. Guidelines for military mental health and medical professionals are explored.

Miyashita, M., A. Nakamura, et al. (2008). "Identification of quality indicators of end-of-life cancer care from medical chart review using a modified Delphi method in Japan." American Journal of Hospice & Palliative Medicine **25**(1): 33-38.

Montalvo, I. (2007). "The National Database of Nursing Quality Indicators (NDNQI)." Online Journal of Issues in Nursing **12**(3): 13p.

Moor, S. (2007). "Population-based clinical indicators for cancer." Internal Medicine Journal **37**(3): 210-211.

Morfeldt-Manson, L., I. Julander, et al. (1989). "Dermatitis of the face, yellow toe nail changes, hairy leukoplakia and oral candidiasis are clinical indicators of progression to AIDS/opportunistic infection in patients with HIV infection." Scandinavian Journal of Infectious Diseases **21**(5): 497-505.
In a prospective longitudinal study of 89 men with HIV infection and persistent generalized lymphadenopathy (PGL) we tried to find clinical signs predictive of development to

AIDS/opportunistic infection (OI). The mean observation time was 47 months. 27 patients (30%) developed AIDS/OI after a mean of 37 months. The estimated median time from diagnosis of PGL to AIDS/OI was 68 months. Four clinical signs of progression towards AIDS/OI were identified: dermatitis of the face, yellow toe nail changes, hairy leukoplakia and oral candidiasis. One or more of these signs were recorded in 25/27 (93%) of the patients before the development of AIDS/OI. The estimated time from registration of each sign to AIDS/OI was: dermatitis of the face, 29 months; yellow toe nail changes, 21 months; hairy leukoplakia, 18 months; and oral candidiasis, 10 months. The estimated median time from herpes zoster to AIDS was only slightly shorter than the estimated time from diagnosis of PGL to AIDS/OI.

Morsch, C., L. F. Goncalves, et al. (2005). "Renal disease severity index, clinical indicators and mortality of patients in hemodialysis." Revista Da Associacao Medica Brasileira **51**(5): 296-300.
OBJECTIVE: Comorbidity is a major factor influencing mortality in hemodialysis patients. Kt/V, hematocrit and albumin levels have also been associated with mortality in these patients. The purpose of this study was to evaluate the severity of comorbidity, Kt/V, hematocrit and albumin levels as predictors of mortality in patients on hemodialysis therapy. METHODS: Forty patients were followed up during 12 months and assessed in relation to social demographic characteristics, time on dialysis therapy, presence of diabetes, Kt/V, hematocrit and albumin levels, also comorbidities. The impact of comorbidity on mortality was assessed by the end-stage renal disease severity index (ESRD-SI). RESULTS: Mean ESRD-SI scores for survivals (85%) and deaths (15%) were 22 +/- 14.8 vs. 44 +/- 12.4 ($p < 0.001$), and for diabetic (29%) and non-diabetic patients (71%), 40 +/- 15.1 vs. 19 +/- 12.5 ($p < 0.001$). An inverse correlation was observed between ESRD-SI scores and albumin ($r = -0.475$; $p < 0.005$). Albumin levels = 3.6 g/dL were mostly observed (82%) in patients without diabetes ($p = 0.021$). A correlation was observed between hematocrit and albumin levels ($r = 0.544$; $p < 0.001$). For each 1-point increase in the ESRD-SI scores, there was a 10% increase in the risk of death ($p = 0.0093$). CONCLUSION: The ESRD-SI is useful to assess the severity of comorbidities and to predict mortality in hemodialysis patients.

Morsch, C. M., L. F. Gonzalves, et al. (2006). "Health-related quality of life among haemodialysis patients -- relationship with clinical indicators, morbidity and mortality." Journal of Clinical Nursing **15**(4): 498-504.
Aim. To verify the association between quality of life and morbidity, mortality and clinical indicators in haemodialysis patients. Background. While a number of therapies have been reported to increase quality of life in end-stage renal disease, patients report that they remain substantially burdened by limited physical functioning and by dialysis-related symptoms. Indeed, quality of life may be the most critical outcome for those undergoing haemodialysis. Furthermore, quality of life has been associated with clinical indicators, morbidity and survival in haemodialysis patients. Design. Descriptive cohort study of patients undergoing haemodialysis at the Nephrology Hemodialysis Unit of the Hospital de ClÃnicas in Porto Alegre, Brazil. Methods. Forty haemodialysis patients were followed for 12 months and evaluated for demographics, time on dialysis, diabetes mellitus, clinical indicators (dose of dialysis - Kt/V, haematocrit and serum albumin) and comorbidities. The comorbidities were evaluated with the end-stage renal disease severity index and health-related quality of life with The Medical Outcomes Study 36 (SF-36). Results. Men present higher health-related quality of life scores in the energy and fatigue component ($P = 0.04$). Patients treated for over one year at the beginning of follow up and patients with less schooling had better results in General Health Perception ($P < 0.05$). The health-related quality of life evaluation of patients who later died showed that they already had a worse perception of physical functioning as compared to the survivors ($P = 0.05$). Patients with diagnosed diabetes perceived their physical functioning more negatively compared with those with other etiologies of end-stage renal disease ($P = 0.045$). We found a correlation between physical functioning and serum albumin ($r = 0.341$, $P < 0.05$) and between physical functioning and haematocrit ($r = 0.317$, $P < 0.05$). The end-stage renal disease severity index was more strongly related to physical functioning ($r = -0.538$, $P < 0.001$). Comparing the patients' results to the indicators above and below the established targets, we observed a trend to worse health-related quality of life in patients with Kt/V above target. However, in the case of albumin, patients with results above target tended to have better results. Conclusion. A close relationship was observed between

quality of life and morbidity and mortality. Among the clinical indicators, albumin and haematocrit have the greatest influence on quality of life. Relevance to clinical practice. Haemodialysis patients experience various problems that may adversely influence their quality of life. Special care must be given to those who have diabetes mellitus, high morbidity scores, low serum albumin and low haematocrits.

Mulley, A. G. and A. G. Mulley (1999). "Learning from differences within the NHS. Clinical indicators should be used to learn, not to judge." BMJ **319**(7209): 528-30.

Nacey, J. N., B. Delahunt, et al. (1986). "Renal cell carcinoma: I. Clinical indicators of prognosis." New Zealand Medical Journal **99**(806): 531-3.
A retrospective analysis was carried out on 162 patients presenting to Wellington Hospital with renal cell carcinoma between 1958 and 1978, to evaluate factors that may influence prognosis. Following radical nephrectomy the five year survival was 70% for stages 1 and 2, 53% for stage 3A and 13% for stages 3B and 3C. No patient with distant metastases survived this period. Those with renal vein or caval involvement had a significantly worse prognosis than those with stage 1 or 2 disease, and a significantly better survival than those with nodal spread. Once the tumour stage had been assigned as a baseline the influence of clinical, haematological and biochemical variables on the prognosis was analysed using a proportional hazard model. The only factor showing a significant independent association with survival was the presentation of the renal cancer as an incidental finding (p less than 0.01). The presence of anaemia or a low peripheral lymphocyte count may be independently associated with survival (p = 0.02, 0.08 respectively). Weight loss, symptoms length, the ESR, abnormality of liver function and tumour size, although associated when considered alone, do not have an independent association and therefore offer little added prognostic information. The age and sex of the patient were not related to survival.

Narayn-Lee, M., V. Aylett, et al. (2004). "National clinical indicators: more questions than answers?" British Journal of Healthcare Management **10**(2): 44-47.

National Health Service Scotland (2007). What are Clinical Indicators? Edinburgh, National Health Service Scotland.

National Health Service Wales (2001). Clinical governance - developing a strategic approach. Cardiff, National Health Service Wales.

National Patient Safety Agency (2009). Incident data. London, National Patient Safety Agency.

Nedkova, V., M. Angelova, et al. (2005). "Serum zinc and some clinical indicators in children with malabsorption syndrome." Pediatriya **45**(4): 41-43+5.
We have investigated the content of serum zinc in children with defined malabsorption syndrome who live in a medico-social institution. 38 children are involved in the study; 17 of them have malabsorption syndrome. Serum zinc is measured through a modified spectophotometric method. Levels of zinc under 10,71 mmol l⁻¹ are considered as zinc deficiency. We have measured low levels of serum zinc: 6,81+/-2,73 mmol l⁻¹, in children with malabsorption syndrome, which are proved to result from low zinc intake with the food and high zinc losses with the stools. The investigated children are treated with oral zinc supplementation (1/2 SupraVit tablet which contains 10 mg zinc) for a period of 30 days. After treatment levels of serum zinc are higher and weight gain is observed.

Neumann, M. E. and M. E. Neumann (2001). "Annual Network/HCFA Report on clinical indicators shows more patients getting better care. But catheter use is up, serum albumin shows little change." Nephrology News & Issues **15**(6): 45-7.

New Zealand Ministry of Health (2009). Quality improvement in the health and disability sector. Wellington, New Zealand Ministry of Health,.

Nguyen, H. B., S. W. Corbett, et al. (2007). "Implementation of a bundle of quality indicators for the early management of severe sepsis and septic shock is associated with decreased

mortality." Critical Care Medicine **35**(4): 1105-1112.

O'Brien, A. P., J. M. Boddy, et al. (2004). "Clinical indicators as measures of mental health nursing standards of practice in New Zealand." International Journal of Mental Health Nursing **13**(2): 78-88.
This paper discusses the utility of Consumer Notes Clinical Indicators (CNCI) as a means to monitor mental health nursing clinical practice against the Australian and New Zealand College of Mental Health Nurses' (ANZCMHN) Standards of Practice for mental health nursing in New Zealand. CNCI are statements describing pivotal mental health nursing behaviours for which evidence can be found in the nurses' case notes. This paper presents 25 valid and reliable CNCI that can be used to monitor mental health nursing practice against the ANZCMHN's Standards of Practice for mental health nursing in New Zealand. The bicultural clinical indicators were generated in focus groups of Maori and non-Maori mental health nurses, prioritized in a three-round reactive Delphi survey of expert mental health nurses and consumers, pilot tested, and applied in a national field study. This paper reports the development and validation of the CNCI, for which achievement is assessed by an audit of the nursing documentation in consumer case notes. The CNCI were tested in a national field study of 327 sets of consumer case notes at 11 District Health Board sites. The results of the national field study show wide variation in occurrence of individual indicators, particularly in the areas of informed consent, information about legal rights, and provision of culturally safe and recovery-focused care. We discuss the implications of using the CNCI to assess the professional accountability of mental health nurses to provide quality care. Recommendations are made regarding the application of the clinical indicators and future research required, determining appropriate benchmarks for quality practice. The CNCI could be adapted for application in other mental health nursing and other mental health professional clinical settings.

O'Brien, A. P., C. J. Gaskin, et al. (2007). "Generation of statements for the development of clinical indicators for mental health nursing in New Zealand: achieving a bicultural focus." Asian Journal of Nursing **10**(3): 184-190.
Aim: In this paper, the first of 4 stages of a large study aiming to develop culturally and clinically valid clinical indicators to flag the achievement of mental health nursing standards of practice in New Zealand are described.
Methods: A bicultural design was employed throughout the research project to ensure that nurses' views of practice and the cultural differences between New Zealand's indigenous Maori and non-Maori peoples could be identified. Accordingly, separate focus groups of Maori- and non-Maori-experienced mental health nurses were asked to develop lists of statements reflective of the Australian and New Zealand College of Mental Health Nurses' Standards of Practice in New Zealand.
Results: The focus group participants produced 473 statements, which were synthesised into 190 clinical indicator statements. In keeping with the bicultural research design, Maori and non-Maori data were analysed separately until the data were merged to provide a single set of indicator statements. Although both Maori and non-Maori groups wrote statements relevant to clinical practice, there was a difference in the way the 2 groups addressed cultural issues. The Maori focus group wrote statements about cultural issues for 4 of the 6 Standards of Practice, whereas the non-Maori focus group participants wrote statements about cultural issues for only the Standard focusing on cultural safety.
Conclusion: The research design of this project in mental health nursing was unique in that it sought the perspectives of both indigenous and non-indigenous nurses about quality mental health nursing practice related to the professional standards of practice. The involvement of Maori and non-Maori mental health nurses enhanced the cultural and clinical validity of the study and the data obtained from it. The bicultural approach adopted for the study highlights the need for more mental health nursing research involving indigenous partners.

O'Brien, A. P., A. J. O'Brien, et al. (2003). "The New Zealand development and trial of mental health nursing clinical indicators - a bicultural study." International Journal of Nursing Studies **40**(8): 853-861.
This paper describes the development and validation of bicultural clinical indicators that measure achievement of mental health nursing practice standards in New Zealand (ANZMCHN, 1995, Standards of practice for mental health nursing in New Zealand.

ANZCMHN, Greenacres). A four-stage research design was utilised including focus groups, Delphi surveys, a pilot, and a national field study, with mental health nurses and consumers as participants. During the national field study, consumer files (n=327) from 11 District Health Boards, and registered nurses (n=422) completed an attitude questionnaire regarding the regularity of specific nursing and service activities. Results revealed a variation in the mean occurrence of the clinical indicators in consumer case notes of 18.5-89.9%. Five factors with good internal consistency, encompassing domains of mental health nursing required for best practice, were derived from analysis of the questionnaire. This study presents a research framework for developing culturally and clinically valid, reliable measures of clinical practice.

O'Brien, W. T., Sr., D. A. Rohweder, et al. (2006). "Clinical indicators of radiographic findings in patients with suspected community-acquired pneumonia: who needs a chest x-ray?" Journal of the American College of Radiology **3**(9): 703-6.
PURPOSE: To develop a prediction rule for the use of chest radiographs in evaluating for community-acquired pneumonia (CAP) based on presenting signs and symptoms. PATIENTS AND METHODS: Adult patients with acute respiratory symptoms and positive chest radiographic results from October 2004 through April 2005 were enrolled as positive cases (n = 350). An equal number of age-matched controls with acute respiratory symptoms but negative radiographic results were included. Data analyses were performed on the 6 most common individual clinical indicators (cough, sputum production, fever, tachycardia, tachypnea, and abnormal physical examination results). Additional analyses were performed for any vital sign abnormality and for the presence of vital sign or physical examination abnormalities. RESULTS: The data show that vital sign and physical examination findings are useful screening parameters for CAP, demonstrating a sensitivity of 95%, a specificity of 56%, and an odds ratio of 24.9 [corrected] in the presence of vital sign or physical examination abnormalities. In light of these results, the authors developed a prediction rule for low-risk patients with reliable follow-up, which states that chest radiographs are unnecessary in the presence of normal vital signs and physical examination findings. CONCLUSION: The data suggest that chest radiographs are unnecessary in patients with acute respiratory symptoms who present with normal vital signs and physical examination findings. Because approximately 5% of cases would be missed, however, these criteria are useful only for patients with reliable follow-up and a low likelihood of morbidity if CAP is not detected initially.

Ochs, J., R. Mulhern, et al. (1991). "Comparison of neuropsychologic functioning and clinical indicators of neurotoxicity in long-term survivors of childhood leukemia given cranial radiation or parenteral methotrexate: A prospective study." Journal of Clinical Oncology **9**(1): 145-151.
We prospectively compared neuropsychologic functioning and clinical indicators of neurotoxicity in 49 consecutive childhood leukemia patients in long-term continuous complete remission (CR) who had received two different regimens of CNS prophylaxis by random assignment. Twenty-three patients were treated with 1,800 cGy cranial radiation and intrathecal methotrexate (RT group) and 26 with parenteral methotrexate only (MTX group). Over half of the RT group had somnolence syndrome, and four developed cerebral calcifications late in their clinical course. Abnormal electroencephalograms (EEGs) were seen in 15 patients in the MTX group, and six had early, transient white-matter hypodensities apparent on computed tomographic (CT) scans. Mean scores on standard tests of intelligence and academic achievement, administered after remission induction and again at a median of 6 years after treatment cessation, did not differ significantly between the two groups. However, statistically significant decreases in overall and verbal intelligence quotients (IQs) and in arithmetic achievement were found within both treatment groups. Sixteen of 26 in the MTX group and 14 of the 23 in the RT group had clinically important decreases ([greater-than or equal to] 15 points) on one or more neuropsychologic measures. These changes did not correlate with findings on CT scans, EEGs, or other clinical signs of neurotoxicity. We conclude that 1,800 cGy cranial radiation and parenteral methotrexate, as used in this study, are associated with comparable decreases in neuropsychologic function.

Oddone, A., G. Tommasini, et al. (1981). "Clinical indicators for prediction of extensive myocardial infarct." Bollettino della Societa Italiana di Cardiologia **26**(10): 1107-13.

O'Leary, M. R., M. S. Smith, et al. (1989). "Application of clinical indicators in the emergency department." Journal of the American Medical Association **262**(24): 3444-3447.

Clinical indicators were developed and used to assess the quality of patient care resulting from the system of shared responsibility between emergency department (ED) and radiology department faculty physicians for interpretation of ED roentgenograms. The first indicator - all discrepancies in roentgenogram interpretation between ED and radiology department faculty - measured an overall discrepancy rate of 3.3% (776 films). Three hundred fifty-two apparent discrepancies were not related to the accuracy with which ED faculty interpreted films, resulting in a revised overall discrepancy rate of 1.8%. The second indicator - undesirable patient care outcomes as a result of delayed accurate radiological diagnosis - measured an occurrence rate of 0 after clinical reevaluation of more than 99% of patients within 24 hours of initial ED evaluation. Aspects of the development and use of clinical indicators are discussed in relationship to the broader monitoring and evaluating process necessary for the continuous improvement of patient care.

Organisation for Economic Co-Operation and Development (2000). Health Care Quality Indicators Project. Paris, Organisation for Economic Co-Operation and Development (OECD).

Ottman, R., J. H. Lee, et al. (1996). "Clinical indicators of genetic susceptibility to epilepsy." Epilepsia **37**(4): 353-361.
We evaluated clinical indicators of genetic susceptibility to epilepsy in the families of 1,957 adults with epilepsy (probands) ascertained from voluntary organizations. Very few of the probands in this series had idiopathic epilepsy syndromes. Among relatives of probands with postnatal CNS insults, risks of epilepsy were no higher than in the general population. Risk was increased in relatives of probands without identified CNS insults (i.e., those with idiopathic/cryptogenic epilepsy) or with neurological deficit presumed present at birth, compared with relatives of probands with postnatal CNS insults. Among relatives of probands with idiopathic/cryptogenic epilepsy, risks were higher in parents and siblings, but not in offspring, of probands with generalized onset as compared with partial onset seizures. Risks in offspring were higher if the probands had onset of idiopathic/cryptogenic epilepsy before age 10 as compared with age [greater-than or equal to]10 years, but risks in parents and siblings were not associated with the proband's age at onset. These results suggest that genetic susceptibility increases risk of some forms of cryptogenic epilepsy and of epilepsy associated with neurological deficit presumed present at birth, but not of postnatal symptomatic epilepsy. The influences on risk in offspring may differ from those in parents and siblings.

Ouwens, M. M. M. T. J., H. A. M. Marres, et al. (2007). "Quality of integrated care for patients with head and neck cancer: Development and measurement of clinical indicators." Head and Neck **29**(4): 378-386.
Background. To improve the quality of integrated care, we developed indicators for assessing current practice in a large reference center for head and neck oncology. Methods. We defined a set of indicators based on integrated care literature, national evidence-based guidelines for patients with head and neck cancer, and the opinions of professionals and patients. We tested this set regarding assessement of current practice and clinimetric characteristics. Results. The final set consisted of 8 integrated care indicators and 23 specific indicators for patients with head and neck cancer. Current practice assessment produced high scores for the integrated care indicators, but the specific indicators showed room for improvement. The practice test showed that 9 indicators had good applicability. Conclusions. The indicators, while based on evidence-based guidelines and the principles of integrated care, should incorporate patients' opinions and include a practice test. Our results show that the quality of integrated care for patients with head and neck cancer could be improved. copyright2006 Wiley Periodicals, Inc.

Pang, B. S., Z. Wang, et al. (2003). "Dynamic changes in blood cytokine levels as clinical indicators in severe acute respiratory syndrome." Chinese Medical Journal **116**(9): 1283-1287.
Objective. To investigate the dynamic changes observed in serum levels of interleukins (ILs), tumor necrosis factor-alpha (TNF-alpha and transforming growth factor-beta₁ (TGF-beta₁) in severe acute respiratory syndrome (SARS) patients. Methods. Sixty-one cases of SARS with positive antibodies to SARS coronavirus (SARS-CoV) were classified into the following categories: initial stage (3 - 7 days), peak stage (8 - 14 days), and

remission and recovery stage (15 - 27 days). Forty-four healthy individuals were used as controls. Serum levels of ILs, TNF-alpha and TGF-beta₁ were measured in all subjects. Serum antibodies to SARS-CoV were detected only in SARS cases. Results. The mean concentration of serum IL -6 in SARS patients did not differ from that in the control group in initial and peak stages, but became significantly higher in remission and recovery stage compared with the control group, initial and peak stages (P < 0.01). The mean concentration of serum IL-8 in SARS patients did not differ from that of the control group in initial stage, but was significantly higher than control group in peak stage and remission and recovery stage (P < 0.05). And it was more significantly higher in remission and recovery stage than in peak stage (P < 0.01). The mean concentrations of IL-16 and TNF-alpha in SARS patients were higher than those of the control group for every length of the clinical courses investigated, and were especially high in remission and recovery stage (P <0.01). SARS patients experienced higher concentration of serum IL-13 compared with the controls in initial stage (P < 0.01), but returned to normal levels in peak stage and in remission and recovery stage. The mean concentration of serum IL-18 in SARS patients was significantly lower than that of the control group during all clinical courses (P < 0.05). The mean concentration of serum TGF-beta₁ in SARS patients was higher than that of the control group during all clinical courses. Although TGF-beta₁ in serum decreased in remission and recovery stage in SARS patients, the average was still higher than that of the control group (P <0.01). Conclusions. Most proinflammatory cytokines and TGF-beta₁ were elevated during the early phase of SARS, which may be associated with lung infiltration and proliferation. Concurrently, the mean concentration of serum IL-13 decreased gradually, and the mean concentration of serum IL-18 level in SARS patients was lower than that of the control group during all the courses of SARS, suggesting that the immune state of the patients with SARS was obviously abnormal. Observing the dynamic changes in blood cytokine levels can provide a scientific basis to assess pathogenesis and efficacy of clinical treatment of SARS.

Pawsey, M. (2000). "Accreditation and clinical indicators: experiences from Australia." Ugeskrift for Laeger **162**(12): 1753-4.

Paxton, L. A., S. C. Redd, et al. (1996). "An evaluation of clinical indicators for severe paediatric illness." Bulletin of the World Health Organization **74**(6): 613-618.
To help reduce paediatric morbidity and mortality in the developing world, WHO has developed a diagnostic and treatment algorithm that targets the principal causes of death in children, which include acute respiratory infection, malaria, measles, diarrhoeal disease, and malnutrition. With this algorithm, known as the Sick Child Charts, severely ill children are rapidly identified, through the presence of any one of 13 signs indicative of severe illness, and referred for more intensive health care. These signs are the inability to drink, abnormal mental status (abnormally sleepy), convulsions, wasting, oedema, chest wall retraction, stridor, abnormal skin turgor, repeated vomiting, stiff neck, tender swelling behind the ear, pallor of the conjunctiva, and corneal ulceration. The usefulness of these signs, both in current clinical practice and within the optimized context of the Sick Child Chart algorithm in a rural dictrict of western Kenya, was evaluated. We found that 27% of children seen in outpatient clinics had one or more of these signs and that pallor and chest wall retraction were the signs most likely to be associated with hospital admission (odds ratio (OR) = 8.6 and 5.3, respectively). Presentation with any of these signs led to a 3.2 times increased likelihood of admission, although 54% of hospitalized children had no such signs and 21% of children sent home from the outpatient clinic had at least one sign. Among inpatients, 58% of all children and 89% of children who died had been admitted with a sign. Abnormal mental status was the sign most highly associated with death (OR = 59.6), followed by poor skin turgor (OR = 5.6), pallor (OR = 4.3), repeated vomiting (OR = 3.6), chest wall retraction (OR = 2.7), and oedema (OR = 2.4). Overall, the mortality risk associated with having at least one sign was 6.5 times higher than that for children without any sign. While these signs are useful in identifying a subset of children at high risk of death, their validation in other settings is needed. The training and supervision of health workers to identify severely ill children should continue to be given high priority because of the benefits, such as reduction of childhood mortality.

Pencheon, D. (2008). The good indicators guide: how to use and choose indicators. London, NHS Institute for Innovation and Improvement.

Pervez, H., A. Bhargwa, et al. (2003). "Accuracy and reliability of the clinical indicators related to hip fractures." Injury **34**(7): 522-524.
In order to assess the accuracy of the clinical indicators for hip fracture outcomes, we compared the hip fracture outcomes of in-hospital mortality and length of hospital stay as determined by the hospital coded records with that of a prospectively recorded separate hip fracture database over a 5-year period. There was excellent correlation between the two databases with in-hospital mortality figures of 78/1264 versus 79/1299 patients, a difference of 0.1%. For discharge within 28 days the figures for the two databases were 930/1264 versus 987/1299, a difference of 2.4%. The main reason for differences between the databases was caused by ambiguous clinical codes in 66 cases and errors in coding for 57 cases. The next step is to find ways of using these indicators to promote real improvement in the care of these patients.

Pervez, H., A. Bhargwa, et al. (2004). "Erratum: Accuracy and reliability of the clinical indicators related to hip fractures (Injury 34:7 (522-524))." Injury **35**(2): 215.

Peskett, M. J. (1999). "Clinical indicators and other complications in the recovery room or postanaesthetic care unit." Anaesthesia **54**(12): 1143-1149.
Clinical indicators and complications occurring in the recovery room or post anaesthetic care unit were recorded for patients who had an anaesthetic procedure during 1995, 1996 and 1997 (n = 13,,266). Clinical indicators measured were those developed by the Australian Council on Healthcare Standards in conjunction with the Australian and New Zealand College of Anaesthetists, and three other indicators. All patients were assessed and positive data were collected by nursing staff on a standardised form which was checked and collated by the anaesthetist responsible for the recovery room (the author). The rates for some indicators were higher than the Australian Council on Healthcare Standards 1997 rates, but the overall rates of complications were comparable with, or lower than, those in published series. Clinical indicator data are seen as a valuable quantitative tool for quality assurance, particularly if collected as part of a more comprehensive programme.

Pezzilli, R., A. M. Morselli Labate, et al. (2007). "Quality of life and clinical indicators for chronic pancreatitis patients in a 2-year follow-up study." Pancreas **34**(2): 191-196.
OBJECTIVES: There are no data available that evaluate the possible modifications of the quality of life during the clinical course of chronic pancreatitis. To evaluate the outcome for patients with chronic pancreatitis in a 2-year follow-up study. METHODS: The Short Form 12 Health Survey Italian version questionnaire was used for the purpose of the study. The questionnaire generates 2 summary scores: the physical component summary (PCS-12) and the mental component summary (MCS-12). Eighty-three patients with chronic pancreatitis were studied with a mean (+/-SD) interval time of 2.3 +/- 0.2 years between the first and the second evaluation. RESULTS: There was a significant increase in the frequency of diabetes mellitus (P = 0.008), nonpancreatic surgery (P = 0.016), and comorbidities (P = 0.004). The PCS-12 (44.7 +/- 10.7) and MCS-12 (44.1 +/- 13.3) were not significantly different in comparison with the baseline evaluation (PCS-12, 43.7 +/- 9.8; MCS-12, 44.3 +/- 11.4). The PCS-12 score worsened in 17 (20.5%) patients, 44 (53.0%) had a stable PCS-12 score, and the remaining 22 (26.5%) improved their PCS-12 score. Regarding the mental score, 15 (18.1%) patients worsened, 52 (62.7%) had a stable MCS-12 score, and the remaining 16 (19.3%) improved their MCS-12 score. Only age at diagnosis was significantly related to the change of the MCS-12 score (P = 0.028, positive relationship). CONCLUSIONS: The information given by quality-of-life assessment should be routinely included in the work-up of patients affected by chronic pancreatitis to select those patients with severely impaired physical and mental scores, and to plan an intensive program of medical and psychological follow-up.

Pham, H. H., J. Coughlan, et al. (2006). "The impact of quality-reporting programs on hospital operations." Health Affairs **25**(5): 1412-1422.

Pietrzyk, E., Z. Sadowski, et al. (1990). "Natural and postoperative course of coronary disease in late observations: prognostic value of clinical indicators and invasive and non-invasive studies." Polskie Archiwum Medycyny Wewnetrznej **84**(4): 220-31.

The results of a prospective study in 301 patients (pts) with angiographically documented coronary artery disease are presented. The mean follow-up period was 30 +/- 14 months, the mean age of pts was 48 +/- 9 years. A prognostic significance of 37 indicators obtained from clinical, hemodynamical, angiographical and noninvasive studies was investigated. In the group of pts treated medically (n = 202) the natural history of disease was defined by the following indicators: history of myocardial infarction, congestive heart failure, NYHA functional class III and IV, frequent ventricular premature depolarizations (VPD), abnormal ecg at rest, QT greater than QS2 index, left ventricular (LV) ejection fraction less than 50%, elevation of LV end-diastolic pressure and LV end-diastolic volume index LV wall motion abnormalities in particular dyskinesia, left main coronary artery disease and three vessel coronary artery disease. In a multivariate Cox model analysis, the independent correlates of long-term survival were frequency of VPD (p less than 0.001), NYHA functional class III-IV (p less than 0.003), QT greater than QS2 index (p less than 0.01), LV ejection fraction (LVEF) less than 50% (p less than 0.02). The combination of two indicators: LVEF less than 50% and QT greater than QS2 identify pts with high mortality rate (31%) during a two year follow-up period as compared with only 1% in the group with LVEF greater than or equal to 50% and QT less than or equal to QS2. The different clinical and hemodynamical characteristics of both the groups of pts treated medically or surgically made a reliable comparison of those two methods of treatment impossible.

Plotnick, G. D., H. L. Greene, et al. (1979). "Clinical indicators of left main coronary artery disease in unstable angina." Annals of Internal Medicine **91**(2): 149-53.
Two hundred consecutive catheterized patients with unstable angina pectoris were reviewed to find clinical and noninvasive indicators of left main coronary artery disease (greater than or equal to 50% lesion). Thirty-five patients (17.5% of total) had left main coronary artery disease. There were no differences between patients with and without left main coronary artery disease in age, sex, results of resting electrocardiogram, congestive heart failure, dyspnea during pain, duration of longest pain, arrhythmias, response to medical therapy, or other risk factors. Crescendo angina pectoris (worsening of pre-existing angina), transient ST-segment depression with pain, simultaneous anterior and inferior ST changes during pain, and fluoroscopic calcification of the left main coronary artery were all significantly more common in patients with left main coronary artery disease. However, low sensitivity or low predictive value, or both, limit the usefulness of these clinical predictors. Left main coronary artery disease cannot be reliably predicted in patients with unstable angina pectoris before coronary arteriography.

Pogady, J., G. Hudakova, et al. (1968). "Some clinical indicators in post partum psychoses." Casopis Lekaru Ceskych **107**(33): 1010-2.

Portelli, R. (1997). "Using clinical indicators to change clinical practice." Journal of Quality in Clinical Practice **17**(4): 195-202.
A study of the qualitative information received by the Australian Council on Healthcare Standards (ACHS) Care Evaluation Program (CEP) in 1993 showed that the monitoring of clinical indicators had the potential to stimulate a variety of quality activities within health-care organizations. To determine whether the potential for improved patient outcomes has continued, the ACHS CEP conducted a survey of those organizations which submitted clinical indicator data as part of their accreditation survey in 1995. Analysis of the qualitative data received showed that change was reported on 505 occasions by organizations monitoring the hospital-wide medical and obstetrics and gynaecology clinical indicator sets. Details of 251 reported changes were received through a follow-up survey. These details provide evidence that clinical indicators are being used to implement changes in clinical practice to improve the quality of patient care.

Portelli, R. (1999). "Addressing adverse events through clinical indicators." Journal of Quality in Clinical Practice **19**(2): 79-83.
In an attempt to improve the reporting rate of adverse drug reactions the Adverse Drug Reaction Advisory Committee approached the Australian Council on Healthcare Standards Care Evaluation Program to develop a set of indicators to improve healthcare standards by heightening awareness amongst clinical staff of the morbidity, mortality and financial implications of adverse drug reactions. Ten clinical indicators addressing: (i) reporting of

adverse drug reactions; (ii) adherence to treatment protocols for anaphylaxis; (iii) monitoring of warfarin; and (iv) monitoring of streptokinase, were field tested in ten Australian health-care organizations, to determine that the data were available, that the indicators were relevant to clinical practice and that the measures were achievable. Based on the results of this field test, six adverse drug reaction clinical indicators will be introduced into the Australian Council on Healthcare Standards Evaluation and Quality Improvement Program from January 1999.

Portelli, R., J. Brosi, et al. (1997). "Matching ICD-9-CM codes to clinical indicators -- is it the way to go?" Health Information Management **27**(4): 168-170.
In early 1997, the Australian Council on Healthcare Standards (ACHS) Care Evaluation Program (CEP) collaborated with the National Centre for Classification in Health (NCCH) to determine the feasibility of matching ICD-9-CM codes with a selected number of clinical indicators developed by CEP. While the results of this activity were encouraging, CEP is hesitant in advocating the use of ICD-9-CM as the complete answer to the data collection 'burden' experienced by health care organisations collecting clinical indicator data. CEP is concerned that obtaining clinical indicator data through ICD-9-CM coding alone may limit clinician participation in quality activities, narrow the focus of performance monitoring to one department, potentially compromise the intent of the indicators, and encourage a culture of 'near enough is good enough'. This paper examines the limitations of ICD-9-CM coding as the sole means of extracting clinical indicator data.

Portelli, R., J. Williams, et al. (1997). "Using clinical indicators to change clinical practice." Journal of Quality in Clinical Practice **17**(4): 195-202.
A study of the qualitative information received by the Australian Council on Healthcare Standards (ACHS) Care Evaluation Program (CEP) in 1993 showed that the monitoring of clinical indicators had the potential to stimulate a variety of quality activities within health-care organizations. To determine whether the potential for improved patient outcomes has continued, the ACHS CEP conducted a survey of those organizations which submitted clinical indicator data as part of their accreditation survey in 1995. Analysis of the qualitative data received showed that change was reported on 505 occasions by organizations monitoring the hospital-wide medical and obstetrics and gynaecology clinical indicator sets. Details of 251 reported changes were received through a follow-up survey. These details provide evidence that clinical indicators are being used to implement changes in clinical practice to improve the quality of patient care.

Preston, L. J. (2008). "A survey of quality indicator use in the clinical laboratory." Clinical Laboratory Science **21**(1): 25-32.

Putnam, W., K. N. Bower, et al. (2006). "Quality indicators for cardiac care: national standards in a community context." Journal of Health Services Research & Policy **11**(1): 5-12.

Pyne, J. M., S. M. Asch, et al. (2008). "Quality indicators for depression care in HIV patients." AIDS Care **20**(9): 1075-1083.

Quality Health New Zealand (2009). Quality Health New Zealand. Quality Health New Zealand, Wellington.

Queen, P. M., M. Caldwell, et al. (1993). "Clinical indicators for oncology, cardiovascular, and surgical patients: Report of the ADA Council on Practice Quality Assurance Committee." Journal of the American Dietetic Association **93**(3): 338-344.
Clinical indicators were developed as an ADA project for use by the membership and the Joint Commission on Accreditation of Healthcare Organizations as part of its Agenda for Change. This 3-year project involved three clinical indicator task forces who developed clinical indicators for oncology, cardiovascular, and surgical adult acute-care setting patient populations. The task forces developed clinical indicators that were revised after an extensive field review and validation by field test. The following indicators were recommended: Cardiovascular - Patients at high risk for impaired nutritional status receive nutrition intervention within 5 days of admission or within consecutive 5 days on clear liquid diet/nothing by mouth; Patients make food choices consistent with therapeutic diet. Oncology - No patient is on clear-liquid diet/nothing by mouth without nutrition support for more than 5

days; All patients at moderate or high risk are identified by screening and assessed within 72 hours of admission; Patients at moderate or high risk are able to implement nutrition care plan at discharge. Surgery - No patient is on clear-liquid diet/nothing by mouth without nutrition support for more than 7 days; No patient has weight loss greater than 10% of admission weight at discharge; calorie and protein and/or volume goals for patients on enteral or parenteral nutrition are documented in the medical record; Patients on enteral or parenteral nutrition receive at least 1,000 kcal/day by the fourth day after an operation.

Quinn, M. P., J. Freeman, et al. (1997). "From hard copy to computer integration: developing clinical indicators for quality improvement." Journal for Healthcare Quality: Promoting Excellence in Healthcare **19**(2): 27.

Raik, E. (1998). "Thrombolytic therapy for myocardial infarction: Standards versus clinical indicators." Medical Journal of Australia **169**(1): 59.

Ramirez-Lassepas, M., B. A. Sandok, et al. (1973). "Clinical indicators of extracranial carotid artery disease in patients with transient symptoms." Stroke **4**(4): 537-40.

Rappold, G., W. F. Blum, et al. (2007). "Genotypes and phenotypes in children with short stature: Clinical indicators of SHOX haploinsufficiency." Journal of Medical Genetics **44**(5): 306-313.
Background: Short stature affects approximately 2% of children, representing one of the more frequent disorders for which clinical attention is sought during childhood. Despite assumed genetic heterogeneity, mutations or deletions of the short stature homeobox-containing gene (SHOX) are found quite frequently in subjects with short stature. Haploinsufficiency of the SHOX gene causes short stature with highly variable clinical severity, ranging from isolated short stature without dysmorphic features to Leri-Weill syndrome, and with no functional copy of the SHOX gene, Langer syndrome. Methods: To characterise the clinical and molecular spectrum of SHOX deficiency in childhood we assessed the association between genotype and phenotype in a large cohort of children of short stature from 14 countries. Results: Screening of 1608 unrelated individuals with sporadic or familial short stature revealed SHOX mutations or deletions in 68 individuals (4.2%): complete deletions in 48 (70.6%), partial deletions in 4 (5.9%) and point mutations in 16 individuals (23.5%). Although mean height standard deviation score (SDS) was not different between participants of short stature with or without identified SHOX gene defects (-2.6 vs -2.6), detailed examination revealed that certain bone deformities and dysmorphic signs, such as short forearm and lower leg, cubitus valgus, Madelung deformity, high-arched palate and muscular hypertrophy, differed markedly between participants with or without SHOX gene defects ($p<0.001$). Phenotypic data were also compared for 33 children with Turner syndrome in whom haploinsufficiency of SHOX is thought to be responsible for the height deficit. Conclusion: A phenotype scoring system was developed that could assist in identifying the most appropriate subjects for SHOX testing. This study offers a detailed genotype-phenotype analysis in a large cohort of children of short stature, and provides quantitative clinical guidelines for testing of the SHOX gene.

Rawal, P. H., J. S. Lyons, et al. (2004). "Regional Variation and Clinical Indicators of Antipsychotic Use in Residential Treatment: A Four-state Comparison." Journal of Behavioral Health Services and Research **31**(2): 178-188.
The last decade saw an increase in psychotropic use with pediatric populations. Antipsychotic prescriptions are used frequently in residential treatment settings, with many youth receiving antipsychotics for off-label indications. Residential treatment data from 4 states were examined to determine if regional variation exists in off-label prescription and what clinical factors predict use. The study used clinical and pharmacological data collected via retrospective chart reviews (N = 732). The Child and Adolescent Needs and Strengths Assessment - Mental Health Version was used to measure symptom and risk severity. Of youth receiving antipsychotics, 42.9% had no history of or current psychosis. Statistical analyses resulted in significant regional variation in use across states and yielded attention deficit/impulsivity, physical aggression, elopement, sexually abusive behavior, and criminal behavior as factors associated with antipsychotic prescription in nonpsychotic youth. Antipsychotic prescription is inconsistent across states. Off-label prescription is frequent and likelihood of use increases with behavior problems.

Renard, F., S. Delpire, et al. (2004). "Assessing adolescent' health in school medicine: Quality of life as a complement to clinical indicators." Archives de Pediatrie **11**(12): 1438-1444.
Current medical practices of school health for adolescents are more based on the screening of specific physical problems than on psychosocial and subjective aspects of their health. Objectives. - This study aimed at evaluating the usefulness of a quality of life (QoL) questionnaire during the consultations. Population and methods. - Ninety-five adolescents (mean age: 16.9 years) present for the obligatory medical check-up in a health center in Brussels, were involved in the study. Data of the medical records were analysed and two questionnaires were administrated, one exploring the quality of life (VSP-A), the other the presence of depressive symptoms (CES-D). Results. - These adolescents were in good physical health and had a mean score of global quality of life of 62 (DS =11.2); 17% of the adolescents had significant depressive symptoms (score <24). There was a significant negative correlation between the scores of QoL and depression (R =-0.680, P <0.01), the QoL psychological dimension and depression (R =-0.656, P <0.01), the QoL energy-vitality dimension and depression (R= -0.763, P <0.01). Conclusion. - An evaluation of the quality of life, approaching the mental health of the teenagers in a multidimensional and positive way, can be useful in school medicine for better identifying the medical and psychosocial adolescents needs. It can improve the relevance of the preventive consultation and the interventions of health promotion in schools. copyright 2004 Elsevier SAS. Tous droits re serves.

Rice, R. and R. Rice (1994). "Clinical indicators for a rehabilitation referral." Home Healthcare Nurse **12**(1): 64.

Richards, K. L., D. Olesen, et al. (2003). "Australian Council on Healthcare Standards infection control clinical indicators." Communicable Diseases Intelligence **27 Suppl**: S132-3.

Robertson, H. A. and N. J. MacKinnon (2002). "Development of a list of consensus-approved clinical indicators of preventable drug-related morbidity in older adults." Clinical Therapeutics **24**(10): 1595-1613.
Background: Older patients (aged >65 years) may experience drug-related problems that, if unrecognized, can result in drug-related morbidities (DRMs). According to the literature, 49% to 76% of all DRMs may be preventable; however, there is little consensus as to which are preventable and which are not. Objective: The aim of this study was to develop consensus-approved clinical indicators of preventable DRM (PDRM) in older adults. Geriatricians, clinical pharmacologists, general practitioners, and clinical pharmacists were included in the consensus-building process. Methods: In 2001, a survey containing potential indicators of PDRM was prepared based on previous research and the input of 2 clinical pharmacists. The survey was administered concurrently via the Delphi technique to 2 separate specialist panels (6 geriatricians and 6 clinical pharmacologists) to generate clinical indicators of PDRMs in older adults. Subsequently, a focus group of 12 general practitioners (GPs) assessed these PDRM indicators in Nova Scotia, Canada. Results: The specialist panels generated 58 consensus-approved clinical indicators of PDRMs in older adults after 2 rounds of the Delphi technique. The GPs agreed with 52 (90%) of these PDRM indicators. Conclusions: This study generated consensus-approved indicators of PDRMs in older adults, which could be used by health professionals to identify patients at risk for PDRMs. The indicators could also have a role in quality measurement systems and in epidemiologic research. Furthermore, the indicators could complement existing clinical indicators and establish an important link between patterns of care and clinical outcomes.

Robledo, C., J. Zhang, et al. (2007). "Clinical indicators for success of misoprostol treatment after early pregnancy failure." International Journal of Gynecology and Obstetrics **99**(1): 46-51.
Objective: To identify clinical indicators for success of misoprostol treatment after early pregnancy failure. Methods: A total of 473 women with early pregnancy failure received 800 mug of vaginal misoprostol on treatment day 1. At the follow-up visit on day 3, a second dose was given if expulsion was incomplete. On day 8, vacuum aspiration was offered if expulsion had not occurred. Ultrasonography was used as gold standard for success. A Classification and Regression Tree analysis was undertaken to derive two decision trees for the success of

misoprostol treatment on study days 3 and 8. Results: Heavy bleeding after the first dose and an open cervical os were identified as clinical indicators of treatment success on day 3. Treatment success occurred in 84% of women with either or both indicators. Reporting passage of tissue after a second misoprostol dose and old blood in the vagina were potential indicators of treatment success or failure on day 8. A woman with either of these indicators has a 65% chance of treatment success after the second dose. Conversely, a woman with neither indicator on day 8 has a 94% chance of treatment failure. Conclusion: Standard clinical findings may be useful as indicators for success or failure of medical management of early pregnancy failure in settings with limited or no access to ultrasonography. More research to identify even better indicators is warranted. copyright 2007 International Federation of Gynecology and Obstetrics.

Rogers, I. R., L. Evans, et al. (1999). "Using clinical indicators in emergency medicine: Documenting performance improvements to justify increased resource allocation." Journal of Accident and Emergency Medicine **16**(5): 319-321.
Objectives: To demonstrate how emergency department triage scale and thrombolysis indicator data can be used to document the impact of a substantial increase in resource allocation. Methods: Descriptive study in an emergency department of an adult tertiary hospital in Perth, Australia during similar periods of the year both before and after a substantial increase in emergency department staff, equipment, and system resources. The study group comprised a total of 11,048 emergency department attendances and all cases of emergency department initiated thrombolysis or acute angioplasty. Outcome was measured using numbers seen and percentage seen within indicator threshold time together with admission rates in each of the five triage categories as well as by using time from presentation to initiation of reperfusion treatment in acute myocardial infarction. Results: The proportion of patients seen within the prescribed indicator time increased by 16.4% (95% confidence interval 14.4% to 18.2%). The increase was most pronounced in triage category 2 (32.7%). Median time to thrombolysis fell by 30 minutes to 37 minutes (p = 0.0002). Conclusions: Use of the Australasian national triage scale and time to thrombolysis clinical indicator data allows a quantitative assessment of the impact of increased emergency department resource allocation.

Rosenberg, N. M. and T. Bobowski (1988). "Clinical indicators for lumbar puncture." Pediatric Emergency Care **4**(1): 5-8.
This study was conducted to demonstrate that experienced pediatricians using standard clinical indications for performing a lumbar puncture should have a higher yield of positive spinal taps than previously reported and also can detect bacterial meningitis. These indicators included temperature elevation, inability to be consoled, level of alertness, nuchal rigidity, bulging fontanel, decreased appetite, rash, referral, and febrile seizures. Eighty-two of 381 (22%) lumbar punctures were positive for pleocytosis and/or organisms. Patients were divided into two groups, consisting of those with one indicator (low risk) and those with greater than one indicator (high risk). Thirteen of 14 patients with bacterial meningitis were placed in the high risk group. The single patient in the low risk group had been pretreated with antibiotics. The positive predictive value in bacterial meningitis for a score greater than one was 5%. The average number of clinical indicators in bacterial meningitis was 3.7, versus 2.4 in viral meningitis and 1.6 without meningitis. These findings suggest that, in the absence of prior antibiotic therapy, an experienced pediatrician can clinically detect patients at high risk for bacterial meningitis. Nonbacterial meningitis cannot be as readily detected clinically.

Rubin, H. R., P. Pronovost, et al. (2001). "The advantages and disadvantages of process-based measures of health care quality." International Journal for Quality in Health Care **13**: 469-474.

Rubin, H. R., P. Pronovost, et al. (2001). "From a process of care to a measure: the development and testing of a quality indicator." International Journal for Quality in Health Care **13**: 489-496.

Rudman, D., D. Bross, et al. (1994). "Clinical indicators derived from the patient assessment instrument in the long-stay residents of 69 VA nursing homes." Journal of General Internal Medicine **9**(5): 261-267.

Objectives: Previous work has shown that clinical indicators reflecting occurrence of bedsores, behavioral disturbances, and deterioration of activities of daily living (ADLs) can be calculated for the long-stay residents of Veterans Affairs (VA) nursing homes from the standard biannual Patient Assessment Instrument (PAI). The present study aimed to construct national curves for these indicators, against which each facility could in the future compare its own values; and to determine the correlations between the indicator values and selected nursing home characteristics. Methods: Eight indicators were calculated for the long-stay (more than six months) residents of the 69 VA nursing homes housing 50 or more such patients from the 1992 PAI data. The indicators were: prevalence of bedsores; incidence of bedsores; prevalence of physically aggressive behavior; incidence of aggressive behavior; and frequencies of six-month losses of eating, mobility, transfer, and toileting functions by the initially independent residents. Results: There was a two- to sixfold difference between the most favorable quartile and the least favorable quartile for the eight indicators. Significant correlations across institutions were found between the prevalence and incidence of bedsores, the prevalence and incidence of aggressive behavior, and the frequencies of declines in the four ADLs by the initially independent residents. One or several of the indicators were significantly superior in nursing homes with these characteristics: a smaller size, a slower resident turnover rate, a smaller proportion of residents with nonorganic psychoses, a lower ratio of short-stay to long-stay residents, and a lower ratio of independent to dependent long-stay residents. Conclusions: These data provide national standards against which each VA nursing home can compare its PAI-derived clinical indicator values. The outcomes measured by these indicators appear to be influenced both by casemix and by environmental factors.

Rudman, D., D. E. Mattson, et al. (1993). "Comparison of clinical indicators in two nursing homes." Journal of the American Geriatrics Society **41**(12): 1317-1325.
Objective: Pressure ulcer prevalences in 30 VA nursing homes in 1986 ranged from 0% to 15%. The institutions with lowest ('A') and highest ('B') prevalence were selected for further examination. Design: Analysis of nursing home files for five study periods, each lasting 6 months. Setting: A and B were 60-bed rural and 280-bed urban facilities, respectively. Measurements: Eleven outcome indicators were calculated for each study period: prevalences and incidences of pressure ulcer, aggressive behavior and disruptive behavior, 6-month declines in each of the four activities of daily living (ADLs), and prevalence of underweight. Results: Populations in A and B were similar with regard to age, sex, length of stay, degree of dependency, and level of nursing care. All indicators for the first study period were more favorable in A than in B. In addition, underweight (body mass index <22 kg/M²) was significantly less prevalent in A than in B. The differences between the two institutions in the indicators were persistent over the five study periods from 1988 to 1991. Conclusions: The populations of A and B were similar in the available measures of severity of illness. Nevertheless, the residents in nursing home A were significantly less likely to experience adverse outcomes than were the residents in nursing home B. The virtual absence of pressure ulcers, physical aggression, and verbal disruption in nursing home A, despite the presence of many immobile and demented residents, suggested that these complications can mostly be prevented.

Ruibal Morell, A. (2001). "Tumoral secretion markers: Something more than clinical indicators." Revista Espanola de Medicina Nuclear **20**(5): 349-352.

Sahni, R., J. J. Menegazzi, et al. (1997). "Paramedic evaluation of clinical indicators of cervical spinal injury... presented at the annual meeting of the National Association of EMS Physicians, San Diego, California, July 1996." Prehospital Emergency Care **1**(1): 16-18.
Purpose. Standard prehospital practice includes frequent immobilization of blunt trauma patients, oftentimes based solely on mechanism. Unnecessary cervical spine (c-spine) immobilization does have disadvantages, including morbidity such as low back pain and splinting, increased scene time and costs, and patient-paramedic conflict. Some emergency physicians (EPs) use clinical criteria to clear trauma patients of c-spine injury. If paramedics were able to apply clinical criteria in the out-of-hospital setting, then unnecessary c-spine immobilization could be safely avoided. The authors designed a prospective, randomized, simulated trial to determine the level of agreement between paramedic and EP assessments of clinical indicators of c-spine injury, hypothesizing that there would be substantial agreement

between them. Methods. A convenience sample of ten paramedics and ten attending EPs participated. Ten standardized patients, with various combinations of positive and negative findings, were examined simultaneously by EP-paramedic pairs. Each pair evaluated five randomly assigned patients for six clinical criteria: 1) alteration in consciousness, 2) evidence of intoxication, 3) complaint of neck pain, 4) cervical tenderness, 5) neurologic deficit or complaint, and 6) distracting injury. If any criterion was positive, clinical clearance was considered to have failed, and the simulated patient would have been immobilized. Fifty pairs of examinations were performed. The kappa statistic was utilized to determine level of agreement between the two groups for each criterion and for the immobilization decision. A kappa of 0.40 to 0.75 denotes good agreement and >0.75 denotes excellent agreement. Results. The kappas for the six criteria were: 1) 0.77; 2) 0.68; 3) 0.62; 4) 0.73; 5) 0.68; and 6) 0.62. The kappa statistic for the immobilization decision was 0.90. In only one case did the immobilization decisions differ; the paramedic indicated immobilization, whereas the physician did not. Conclusion. In this model, there was excellent agreement between paramedics and physicians when evaluating simulated patients for possible c-spine injury. No patient requiring immobilization would have been clinically cleared by paramedics. These data support the progression to a propsective field trial evaluating the use of these criteria by paramedics.

Sarkissian, S. and C. Wallace (1995). "Clinical indicators contributing to I.C.U. length of stay in elective craniotomy patients with brain tumour." AXON/ L'AXONE **17**(2): 42-45.
The immediate purposes of this study are (a) to indicate the I.C.U. and hospital length of stay in elective craniotomy patients with brain tumour, and (b) to identify the clinical indicators that contribute to the I.C.U. length of stay. The ultimate purpose is to contribute to a growing body of knowledge in providing quality and cost effective patient outcomes by creating appropriate vehicles for further research in the field of neuroscience. The following clinical indicators are identified: pre-op patient admission to ward or same day admit unit, O.R cancellations, type of tumour, nursing staff availability, intubation on admission, I.C.U. length of stay, and post-op complications. The results of this pilot study, with sample size of 55 patients, could assist us in the nursing profession to develop an appropriate Care Map for craniotomy patients with brain tumour.

Savry, C. (2007). "Clinical indicators for fluid loading during acute circulatory failure." Reanimation **16**(7-8): 645-651.
In spite of an improvement of hemodynamic monitoring, the clinical signs remain the usual criteria in the decision for fluid challenge during acute circulatory failure, as well as in the evaluation of the therapeutic efficiency. They have the advantage to be immediately and easily accessible. The decrease of blood flow causes an immediate sympatomimetic stimulation and complex, heterogeneous modifications of blood flow to different organs. The sedation strongly decreases sympatomimetic stimulation and modifies the adaptation of the blood flow decrease. If they are taken separately, clinical signs have a low sensibility and specificity because of multifactorial influences independent of the blood volume. Clinical context and anamnesis are thus, fundamental factors to decide fluid loading. Postural maneuvers, especially passive leg raising, improve the accuracy of static clinical signs. For ventilated patients, when using an usual monitor, noninvasive functional hemodynamic monitoring of fluid, responsiveness is possible with the use of pulse oxymeter plethysmographic wave analysis and the use of end-tidal CO₂ monitoring. When replacing clinical signs in their context and associating them, one can have a body of argument allowing to establish an early indication for fluid challenge, before a more sophisticated monitoring can be used to refine therapeutics in second time. copyright 2007 Societe de reanimation de langue francaise.

Schwalenstocker, E., H. Bisarya, et al. (2008). "Closing the gap in children's quality measures: a collaborative model." Journal for Healthcare Quality: Promoting Excellence in Healthcare **30**(5): 4-11.

Scott, L. and K. Grimmer (1995). "Clinical indicators: A methodological approach." Journal of Quality in Clinical Practice **15**(1): 51-56.
Clinical indicators offer physiotherapists a tool by which quality of care can be flagged and evaluated. Such a flag requires a measure of the cost of treatment as well as the outcome achieved for that cost. Traditionally, the number of treatments to discharge has been used as

a proxy measure of cost as well as outcome of physiotherapy care. However, physiotherapists recognize that the cost of treatment is an inappropriate reflection of the outcome of care in many instances. The challenge for physiotherapists in developing clinical indicators is to set appropriate flags of quality of care. This paper presents a methodological approach to the development of a flag of performance for acute lower back pain.

Sedlak, J. and E. Curilla (1984). "Serum levels of digoxin in relation to biochemical and clinical indicators." Vnitrni Lekarstvi **30**(10): 999-1004.

Seuc, A. H., M. Lopez, et al. (2009). "Short-term prediction of major lower-limb amputation based on clinical indicators on admission: a single institutional experience in a developing country." International Angiology **28**(1): 38-43.
AIM: The aim of this study was to analyze the possibility of predicting short-term major lower-limb amputation (SMLA) in patients with vascular diagnoses, based only on clinical variables measured on admission. METHODS: A longitudinal, retrospective cohort study of patients with peripheral vascular diagnoses admitted at our Institute was carried out. A stratified sample of 463 patients admitted during 1997, 2000 and 2003, was studied. Logistic regression was used to identify significant predictors of amputation; twelve clinical variables measured on admission were considered as potential predictors. RESULTS: Of the 463 patients, 93 (20%) were amputated. Significant predictors of amputation identified by the logistic regression analysis were "type of lesion" (none; neuro-infectious; ischemic; mixture), "initial diagnosis" (phlebolymphopathies, acute arterial insufficiency, chronic arterial insufficiency, diabetic foot, others), "plantar region lesion" (no; yes), "diabetes" (no; yes), "number of toes affected" (none; 1-2; 3 or more), and "area of leg affected" (none; lower third; + lower third). More than 80% of patients were correctly classified with the final model: sensitivity was 42% and specificity 96%. CONCLUSIONS: It seems that SMLA in patients with vascular diagnoses can be predicted reasonably well using as predictors only clinical variables measured on admission. This is a potentially useful result for Angiology Services located in developing/poor communities. The amputation probability for each patient obtained from the logistic regression model can be used in several ways: 1) the medical care of patients can be customized so that the amputation rate of the whole Service can be reduced, and 2) the amputation probability of the statistical model can be used as an estimation of the severity of the disease in each patient, which in turn can be used to standardize the amputation rates computed on different years; this would allow a better assessment of the Institutional performance over time.

Shekleton, M. (1989). "Clinical indicators of the ability to sustain spontaneous ventilation: a pilot study." Chart **86**(1): 6-6.

Sherry, E., K. Huang, et al. (1999). "Clinical indicators in orthopaedic surgery." Australian and New Zealand Journal of Surgery **69**(10): 692-694.

Sherwood, M. B., A. Garcia-Siekavizza, et al. (1998). "Glaucoma's impact on quality of life and its relation to clinical indicators: A pilot study." Ophthalmology **105**(3): 561-566.
Objective: This study aimed to compare the quality of life (Q of L) of patients with glaucoma and control subjects and to determine the relationships between Q of L and demographic and clinical variables in patients with glaucoma. Design: The study design was a stratified cross-sectional study. Participants: A gender-, race-, and age-stratified cross- sectional sample of patients with glaucoma (n = 56) and control subjects (n = 54) was obtained. Additional patients (n = 12) were included to examine the relationships between glaucoma, its therapy, and Q of L. Intervention: The Medical Outcomes Study short form (MOS-20), the Activities of Daily Vision Scale (ADVS), and questions related to glaucoma and side effects of treatment were administered. Descriptive statistics characterized demographic variables and MOS and ADVS scales. Group differences were evaluated using chi-square, Fisher's and Ordinal Exact, Wilcoxon rank-sum, and two-sample t tests. Spearman rank correlations were obtained between MOS-ADVS scores and clinical and demographic variables. Regression was used for multivariate analysis. Main Outcome Measures: The MOS scores, ADVS scores, visual acuity, visual fields, and demographic variables were measured. Results: Patients scored significantly lower than did the control subjects in all MOS-20 categories except pain. Differences were physical (-20%), role (-43%), mental health (- 10%), general health (-22%),

and social (-9%). The only category that was not statistically significant was that of pain (P = 0.075). In the glaucoma subgroup, there were differences between whites and nonwhites in MOS subscales physical, role, social, pain, and health, and ADVS near vision. In patients, current medications and previous surgeries correlated with ADVS subscales night vision, near vision, and glare; visual acuity and fields correlated with MOS subscales physical, role and health, and all ADVS subscales. A multiple regression model including visual acuity and fields, urban residence, and female gender explained 61% of the variability in ADVS overall score. Conclusions: The Q-of-L perception differed between patients with glaucoma and control subjects. Increasing field loss, decreased visual acuity, and complexity of therapy correlated with patients' reduction in activities of daily vision.

Shimada, Y., I. Yoshiya, et al. (1979). "Crying vital capacity and maximal inspiratory pressure as clinical indicators of readiness for weaning of infants less than a year of age." Anesthesiology **51**(5): 456-9.

Short, T. G., M. Chan, et al. (1995). "Clinical indicators: what does a stay in the recovery room for longer than two hours indicate?" Anaesthesia & Intensive Care **23**(2): 253-4.

Siddins, M. (2002). "Audits, errors and the misplace of clinical indicators: Revisiting the quality in Australian health care study." ANZ Journal of Surgery **72**(11): 832-834.
Publication of the Quality in Australian Health Care Study in 1995 represented a defining moment for Australian health care providers. The high incidence and cost of preventable adverse events underscored a need for defined process, error recognition and audit cycle. Despite this, surgical audit has continued to emphasize clinical indicators relevant to technical performance. The greatest burden of preventable error can be traced to deficiencies in the process by which management expectations are supported. Recognizing this, the focus of clinical audit must be expanded. In particular, outcome assessment should be routine rather than sporadic, and should broadly encompass safety, effectiveness and efficiency. Devolving this responsibility to paraclinical groups is in itself insufficient. Quality and safety cannot be adequately addressed unless surgeons actively participate in audit cycle. Failure to meet this challenge in a transparent and timely manner potentially undermines the future of professional autonomy.

Skews, G., T. Meehan, et al. (2000). "Development and validation of clinical indicators for mental health nursing practice." Australian & New Zealand Journal of Mental Health Nursing **9**(1): 11-18.
A national study was undertaken in Australia to develop and validate a set of clinical indicators for mental health nursing. Using survey and action research procedures, the indicators were developed in two stages. During stage one, focus group interviews involving 39 nurses were conducted at national conferences in Australia and New Zealand in order to provide a pool of indicator statements. A Delphi survey of an Australian sample of mental health nurses (n = 33) was then conducted to refine the indicators. In stage two, the refined indicators were tested and validated in selected clinical settings. A total of 1751 mental health nurses employed at 14 sites were involved in the second stage of the study. The resulting data were used to establish the set of national indicators that the Australian and New Zealand College of Mental Health Nurses will use in practice accreditation and benchmarking.

Skipper, A. (1991). "Collecting data for clinical indicators." Nutrition in Clinical Practice **6**(4): 156-158.
The Joint Commission for Accreditation of Healthcare Organizations is currently testing clinical indicators that will become an important part of hospital quality assurance programs. Implementation of clinical indicators may necessitate more extensive data collection than is now being done. This article reviews important considerations in the development of a data collection system that facilitates the evaluation of indicators of clinical performance. The evolution of the system currently used by the Nutritional Support Service at Pennsylvania Hospital is provided.

Smith, D. L., J. C. Soria, et al. (2004). "Human telomerase reverse transcriptase (hTERT) and Ki-67 are better predictors of survival than established clinical indicators in patients undergoing curative hepatic resection for colorectal metastases." Annals of Surgical Oncology

11(1): 45-51.
BACKGROUND: We evaluated hTERT and Ki-67 expression in patients who underwent curative resection of hepatic colorectal metastases to determine if these markers of cell proliferation correlated better with survival than an established scoring system that is based on clinical predictors. METHODS: Patients operated on between 1993 and 1997 whose survival time was known were analyzed. For each patient, the clinical prognostic score was derived on the basis of primary node status, disease-free interval, number of hepatic tumors, largest tumor, and carcinoembryonic antigen level, and tumor specimens were analyzed for Ki-67 and hTERT with use of standard immunohistochemical techniques. The immunohistochemical analysis was blinded to all patient characteristics. RESULTS: The study included 66 patients. Twenty-six survived less than 2 years after surgery, 19 survived 2-5 years, and 21 survived more than 5 years. Ki-67 positivity and hTERT positivity (labeling indexes greater than or equal to 50%) were observed in 24 patients and 23 patients, respectively. The clinical score did not predict survival, although there was a weak trend toward a lower score in patients with better survival. Both Ki-67 (P =.04) and hTERT (P =.0001) correlated better with survival than did the clinical score. CONCLUSIONS: In patients undergoing curative resection of hepatic colorectal metastases, hTERT and Ki-67 are better predictors of survival than is a score based on clinical features.

Soong, B., K. Grimes, et al. (1999). "The development of clinical indicators -- the impact on midwifery practice in Queensland in the future." Australian College of Midwives Journal **12**(2): 26-31.
Perineal trauma is the most frequently reported complication of labour and delivery in the Qld Perinatal Data Collection. It is documented that some individual accoucheurs seem to be particularly skillful in assisting at birth in a way that minimises perineal trauma. Recent trends within the Qld health industry have emphasised the importance of quality improvement activities focussing on health outcomes. Midwives accoucheur most of the "normal" deliveries in public hospitals, thus it is important that midwives play a leading part in the development and improvement of tools which identify quality outcomes and pinpoint areas for improvement. This study aims to benchmark current practices regarding perineal outcomes. Moreover, the authors aim to initiate discussion towards the development of the first clinical indicators appropriate to midwifery care.

Spies, C., C. Giese, et al. (1996). "The effect of prophylactically administered n-acetylcysteine on clinical indicators for tissue oxygenation during hyperoxic ventilation in cardiac risk patients." Anaesthesist **45**(4): 343-50.
Hyperoxic ventilation, used to prevent hypoxia during potential periods of hypoventilation, has been reported to paradoxically decrease whole-body oxygen consumption (VO2). Reduction in nutritive blood flow due to oxygen radical production is one possible mechanism. We investigated whether pretreatment with the sulfhydryl group donor and O2 radical scavenger N-acetylcysteine (NAC) would preserve VO2 and other clinical indicators of tissue oxygenation in cardiac risk patients. METHODS: Thirty patients, requiring hemodynamic monitoring (radial and pulmonary artery catheters) because of cardiac risk factors, were included in this randomized investigation. All patients exhibited stable clinical conditions (hemodynamics, body temperature, hemoglobin, F1O2 < 0.5). Cardiac output was determined by thermodilution and VO2 by cardiovascular Fick. After baseline measurements, patients randomly received either 150 mg kg-1 NAC (n = 15) or placebo (n = 15) in 250 ml 5% dextrose i.v. over a period of 30 min. Measurements were repeated 30 min after starting NAC or placebo infusion, 30 min after starting hyperoxia (F1O2 = 1.0), and 30 min after resetting the original F1O2. RESULTS: There were no significant differences between groups in any of the measurements before treatment and after the return to baseline F1O2 at the end of the study, respectively. NAC, but not placebo infusion, caused a slight but not significant increase in cardiac index (CI), left ventricular stroke work index (LVSWI) and a decrease in systemic vascular resistance. Significant differences between groups during hyperoxia were: VO2 (NAC: 108 +/- 38 ml min-1m-2 vs placebo: 79 +/- 22 ml min-1m-2; P < or = 0.05), CI (NAC: 4.6 +/- 1.0 vs placebo: 3.7 +/- 1.11 min-1m-2; P < or = 0.05) and LVSWI (NAC: 47 +/- 12 vs placebo: 38 +/- 9; P < or = 0.05). The mean decrease of VO2 was 22% in the NAC group vs 47% in the placebo group (P < or = 0.05) and the mean difference between groups in venoarterial carbon dioxide gradient (PvaCO2) was 14% (P < or = 0.05). ST segment depression (> 0.2 mV) was significantly less marked in the NAC group (NAC: -0.02 +/- 0.17

vs placebo: -0.23 +/- 0.15; P < or = 0.05). CONCLUSIONS: NAC helped preserve VO2, oxygen delivery, CI, LVSWI and PvaCO2 during brief hyperoxia in cardiac risk patients. Clinical signs of myocardial ischemia did not occur such as ST-depression if patients were prophylactically treated with NAC. This suggests that pretreatment with NAC could be considered to attenuate impaired tissue oxygenation and to preserve myocardial performance better in cardiac risk patients during hyperoxia.

Spies, C., C. Giese, et al. (1996). "Influence of prophylactic administration of N-acetylcysteine on the clinical indicators of tissue oxygenation during hyperoxic ventilation in cardiac risk patients." Anaesthesist **45**(4): 343-350.
Hyperoxic ventilation, used to prevent hypoxia during potential periods of hypoventilation, has been reported to paradoxically decrease whole-body oxygen consumption (VO₂). Reduction in nutritive blood flow due to oxygen radical production is one possible mechanism. We investigated whether pretreatment with the sulfhydryl group donor and O₂ radical scavenger N-acetylcysteine (NAC) would preserve VO₂ and other clinical indicators of tissue oxygenation in cardiac risk patients. Methods. Thirty patients, requiring hemodynamic monitoring (radial and pulmonary artery catheters) because of cardiac risk factors, were included in this randomized investigation. All patients exhibited stable clinical conditions (hemodynamics, body temperature, hemoglobin, F(I)O₂ < 0.5). Cardiac output was determined by thermodilution and VO₂ by cardiovascular Fick. After baseline measurements, patients randomly received either 150 mg kg⁻¹ NAC (n = 15) or placebo (n = 15) in 250 ml 5% dextrose i.v. over a period of 30 min. Measurements were repeated 30 min after starting NAC or placebo infusion, 30 min after starting hyperoxia (F(I)O₂ = 1.0), and 30 min after resetting the original F(I)O₂. Results. There were no significant differences between groups in any of the measurements before treatment and after the return to baseline F(I)O₂ at the end of the study, respectively. NAC, but not placebo infusion, caused a slight but not significant increase in cardiac index (CI), left ventricular stroke work index (LVSWI) and a decrease in systemic vascular resistance. Significant differences between groups during hyperoxia were: VO₂ (NAC: 108 +/- 38 ml min⁻¹ n⁻² vs placebo: 79 +/- 22 ml min⁻¹ m⁻²; P [less-than or equal to] 0.05), CI (NAC: 4.6 +/- 1.0 vs placebo: 3.7 +/- 1.11 min⁻¹ m⁻²: P [less-than or equal to] 0.05) and LVSWI (NAC: 47 +/- 12 vs placebo: 38 +/- 9: P [less-than or equal to] 0.05). The mean decrease of VO₂ was 22% in the NAC group vs 47% in the placebo group (P [less-than or equal to] 0.05) and the mean difference between groups in venoarterial carbon dioxide gradient (PvaCO₂) was 14% (P [less-than or equal to] 0.05). ST segment depression (> 0.2 mV) was significantly less marked in the NAC group (NAC -0.02 +/- 0.17 vs placebo: -0.23 +/- 0.15: P [less-than or equal to] 0.05). Conclusions. NAC helped preserve VO₂, oxygen delivery, CI, LVSWI and PvaCO₂ during brief hyperoxia in cardiac risk patients. Clinical signs of myocardial ischemia did not occur such as ST-depression if patients were prophylactically treated with NAC. This suggests that pretreatment with NAC could be considered to attenuate impaired tissue oxygenation and to preserve myocardial performance better in cardiac risk patients during hyperoxia.

Sprigle, S., M. Linden, et al. (2003). "Analysis of localized erythema using clinical indicators and spectroscopy." Ostomy Wound Management **49**(3): 42-52.
Localized erythema is regularly used as an indicator of post-ischemic events, including reactive hyperemia and Stage I pressure ulcers. The National Pressure Ulcer Advisory Panel definition of a Stage I ulcer includes both visual and nonvisual indicators in part to improve identification in darkly pigmented skin. A prospective, repeated-measures design was used to collect information on pressure-induced erythema that includes reactive hyperemia and Stage I pressure ulcers with an emphasis on distinguishing indicators in light and dark skin The relationships among clinical indicators (skin assessments) and results from tissue reflectance spectroscopy, as well as the clinical utility of spectroscopy for discerning tissue blanching status, were examined in a convenience sample of 76 inpatients and outpatients (95 test/control site pairs). Chi-square analysis and generalized logistic models were used to identify relationships and distinguishing characteristics of erythema. Analysis of variance was used to analyze blanching using spectroscopy. Nonblanching sites were more likely to be persistent erythema (c2=5.3; P = 0.021) but exhibited no relationships to temperature, tissue

resilience, or disability. Erythema in subjects with dark skin was more likely to be nonblanching and have poor resilience. Spectrographic analysis of blanching found significant differences across skin pigmentation (P = 0.0001) and blanching status (P = 0.019). These results reinforce the belief that dark skin must be assessed differently than light skin and indicate that clinicians should use persistence of erythema rather than blanching status to judge incipient pressure ulcers. These results validate the use of visual and nonvisual indicators included in the National Pressure Ulcer Advisory Panel Stage I pressure ulcer definition.

Stanchev, Z., A. Maleeva, et al. (1983). "Onset of puberty in boys: comparison between clinical indicators and the changes in the plasma levels of gonadotropic hormones and testosterone." Problemy Endokrinologii **29**(2): 33-9.
The blood plasma LH, FSH and testosterone concentrations were determined in 155 boys aged, 10 to 17 years, by radioimmunoassay. The growth, body weight and puberty degree were detected according to Tanner and the testicular volume by Prader's orchidometer. It was found that hormonal changes in the hypothalamic-hypophyseal-testicular system proceed not parallelly to physical transformations, characteristic of puberty, i.e. hormone concentration rise is seen before the first phenotypical alterations and becomes maximum prior to puberty completion. FSH concentration is 1.67 times as high, reaching the maximum values by the pilar period of the 4th stage and the testicular volume of 8 to 12 ml. LH level is 1.47 times as high, reaching the maximum by the pilar period of the 3d stage and the testicular volume of 8 to 12 ml. Testosterone concentration is 10.47 times as high, reaching the maximum values by the pilar period of the 3d to 6th stage and the testicular volume of 12 to 16 ml. A decrease in the hypothalamic sensitivity to the blood circulating steroids plays a leading role in the puberty pathogenesis.

Statewide Quality Branch (2009). Patient safety indicators. Melbourne, Statewide Quality Branch, Victorian Department of Human Services.

Steiber, A. L. and A. L. Steiber (1999). "Clinical indicators associated with poor oral intake of patients with chronic renal failure." Journal of Renal Nutrition **9**(2): 84-8.
OBJECTIVE: The purpose of this study was twofold: (1) to determine the incidence of patients with chronic renal failure (CRF) who consume less than 75% of their estimated nutritional needs, and (2) to identify factors associated with an oral intake less than 75% of the estimated nutritional needs of patients with CRF. DESIGN: Prospective, descriptive, correlational study of data obtained from patients with a diagnosis of CRF. SETTING: BryanLGH Medical Center East Campus, Lincoln, NE. PATIENTS: Sixty-six patients included on this study met the following criteria: (1) a primary or secondary underlying diagnosis of CRF and (2) not receiving parenteral or enteral (tube feeding) nutritional support on admission. INTERVENTION: Admission data (age, sex, percentage of ideal body weight, weight loss/time, type of dialysis, gastrointestinal history, blood urea nitrogen and creatinine levels, and diet) were collected from the patients' medical records and 2-day kilocalorie (kcal)/protein counts were conducted on consecutive patients admitted to the hospital. The kcal/protein counts were initiated within 24 hours of admission and consisted of six meals and all snacks the patient received. MAIN OUTCOME MEASURE: Only 15% of the patients met 75% or greater of their estimated kcal needs, and 12% met 75% or greater of their estimated protein needs. The mean kcal/kg intake was 11 kcal/kg, with a range of 0 to 27 kcal/kg, and the mean protein/kg intake was 0.42 g of protein/kg, with a range of 0 to 10 g of protein/kg. Of the variables studied for associations with decreased nutrient intake, only emesis mildly correlated with kcal intake. CONCLUSION: Less than one quarter of the patients on this study met 75% or greater of their kcal and protein needs. The average kcal and protein intakes found in this study were far less than current recommendations for hemodialysis, continuous ambulatory peritoneal dialysis, and predialysis patients. However, the results of this study could lead to earlier and more aggressive interventions in patients with CRF at risk for poor oral intake.

Strejcek, J., M. Jira, et al. (1985). "NK activity in the peripheral blood of patients with progressive polyarthritis. I. Correlation with clinical indicators." Casopis Lekaru Ceskych **124**(47): 1451-4.

Strzyzewski, W., A. Rajewski, et al. (1982). "Clinical indicators related to "shock" doses of imipramine in endogenous depressive syndromes." Psychiatria Polska **16**(3): 121-7.

Sunil, T. M. (2004). "Clinical indicators of normal thumb length in adults." Journal of Hand Surgery **29**(3): 489-493.
Purpose: This study was undertaken to obtain clinical indicators of normal relative thumb length in adults. Methods: Fifty two normal hands in 26 volunteers were analyzed. There were 10 women and 16 men. The average age was 34 years (range, 23-47 years). Eighteen of the volunteers (36 hands) were Chinese and 8 were Caucasian (16 hands). All the subjects were healthy with no history of trauma or disease affecting the hand. The relative distal extent of the tip of the thumb was measured against 2 parameters: the length of the proximal phalanx of the index finger and the distance between the proximal digital crease and proximal interphalangeal crease of the index finger. The obtained values were designated as the thumb-proximal phalanx (TPP) index and the thumb-digital crease (TDC) index, respectively. Results: The TPP index was 0.69 (standard deviation = 0.09) and the TDC index was 0.41 (standard deviation = 0.15). There were no statistically significant differences between the right and left hands nor were there any between male and female hands. It was also noticed that when the thumb was adducted the thenar crease and thumb interphalangeal crease came into contact with one another in 90% of the hands. Consequently, an arc traced along the thenar crease could be extended smoothly into the interphalangeal crease of the thumb. This was termed the thenar arc. Positive or negative variances of the thenar arc correlated statistically with variations of the TPP and TDC indexes. Conclusions: This study provides 3 simple clinical indicators of normal thumb length: the TPP index, the TDC index, and the thenar arc. Statistical analysis of the TPP and TDC indexes showed that the values are independent of gender, race, or laterality of the hands examined. These 3 indicators may help the clinician determine normal relative thumb length when reconstructing the thumb in adults. Copyright copyright 2004 by the American Society for Surgery of the Hand.

Swindle, D. N. and R. Wetta-Hall (1993). "Beyond clinical indicators." Nursing Quality Connection **3**(1): 6-7.

Taletene, I. P. and B. A. Gaigalene (1984). "Effect of combined chrisanol and balneological treatment on the clinical indicators and permeability of the synovian membrane in patients with rheumatoid arthritis." Voprosy Kurortologii, Fizioterapii i Lechebnoi Fizicheskoi Kultury(2): 28-31.

Tan, E. K., M. W. Chee, et al. (1999). "Culture positive tuberculous meningitis: clinical indicators of poor prognosis." Clinical Neurology & Neurosurgery **101**(3): 157-60.
Few studies have evaluated culture positive tuberculous meningitis (TBM) as a group. We evaluated certain clinical factors in culture positive TBM which could be associated with a poorer outcome. Out of 40 consecutive TBM patients seen over a period of 4 years in a tertiary referral hospital, 18 culture positive and non-human immunodeficiency virus (HIV) related cases were studied. The mean age was 37.9 +/- 14.9 years (range 9-63); five were males and 13 females. None had any associated active chronic medical illness. Patients (44.4%) started on antituberculous treatment within 24 h of admission. Treatment was initiated at a median time of 48 h upon admission in hospital. Univariate analysis revealed a significant correlation between hydrocephalus (P = 0.007) and poor morbidity and mortality. The other clinical factors were not statistically significant: age (P = 0.36): sex (P = 0.49); symptom duration (P = 0.69); BCG vaccination (P = 0.65); cerebral infarct (P = 0.63); extrameningeal spread (P = 1.00); steroids (P = 1.00); time to treatment (P = 0.94) and stage of disease (P = 0.11). Hydrocephalus was the only significant factor predisposing culture positive TBM patients to a poorer outcome. There was also a trend towards a poorer prognosis in those with advanced stage of the disease.

Tan, P. C., R. Jacob, et al. (2006). "The fetal sex ratio and metabolic, biochemical, haematological and clinical indicators of severity of hyperemesis gravidarum." BJOG: An International Journal of Obstetrics and Gynaecology **113**(6): 733-737.
The association between female fetal sex and hyperemesis gravidarum is well established in European and North American populations. The association between female fetuses and severity of hyperemesis remains uncertain. A retrospective study based on case notes review

of 166 Asian women hospitalised for hyperemesis was performed. Female fetuses were significantly associated with hyperemesis in our population (P= 0.004, OR 1.6, 95% CI 1.2-2.2) as well as associated with severe ketonuria and high urea. When both severe ketonuria and high urea were present at initial hospital admission for hyperemesis, 83% (95% CI 66-93) of the fetuses were female. copyright RCOG 2006 BJOG An International Journal of Obstetrics and Gynaecology.

Tan, P. C., R. Jacob, et al. (2006). "Readmission risk and metabolic, biochemical, haematological and clinical indicators of severity in hyperemesis gravidarum." Australian and New Zealand Journal of Obstetrics and Gynaecology **46**(5): 446-450.
In a retrospective analysis of 192 cases of presumed hyperemesis gravidarum, there were no biochemical markers that predicted hospital readmission. There was, however, statistically significant negative predictive value in abnormal liver function tests. This could represent acute self-limited illness with a component of hepatitis as the cause for the clinical presentation, rather than hyperemesis. copyright 2006 The Authors Journal compilation copyright 2006 The Royal Australian and New Zealand College of Obstetricians and Gynaecologists.

Tan, P. C., R. Jacob, et al. (2007). "Pregnancy outcome in hyperemesis gravidarum and the effect of laboratory clinical indicators of hyperemesis severity." Journal of Obstetrics and Gynaecology Research **33**(4): 457-464.
Objective: To determine pregnancy outcome in hyperemesis gravidarum and the effect of metabolic, biochemical, hematological and clinical indicators of disease severity on outcome. Study Design: A retrospective study based on 166 women hospitalized for confirmed hyperemesis gravidarum from January 2004 to January 2005. For each woman, three controls matched for age, parity and ethnicity were obtained from our 2004 birth register. The effects of laboratory indicators of hyperemesis severity were separately analyzed within the hyperemesis gravidarum study group. Outcome measures include stillbirths, Apgar score, mode of delivery, low birthweight, preterm delivery, labor induction, pregnancy induced hypertension and gestational diabetes. Analysis was by t-test, Fisher's exact test and multivariable logistic regression analysis. Results: Women with hyperemesis had similar pregnancy outcome compared to controls. In the analysis of laboratory indicators of hyperemesis severity and pregnancy outcomes, hypokalemia (adjusted odds ratio [AOR] 2.7: 95% confidence interval [CI] 1.0-6.8) was associated with emergency operative delivery, high creatinine (odds ratio 4.4: 95% CI 1.3-15) with labor induction and raised gamma glutamyltransferase (AOR 7.5: 95% CI 1.2-46) with the development of gestational diabetes. Conclusions: Hyperemesis gravidarum per se was not associated adverse pregnancy outcome. Hypokalemia, high creatinine and raised gamma glutamyltransferase in women with hyperemesis gravidarum were associated with adverse pregnancy outcome. copyright 2007 The Authors.

Thakur, H., S. Chavhan, et al. (2008). "Developing clinical indicators for the secondary health system in India." International Journal for Quality in Health Care **20**(4): 297-303.
Quality problem or issue. One of the prime goals of any health system is to deliver good and competent quality of healthcare. Through World Bank-assisted Maharashtra Health Systems Development Project, Government of Maharashtra in India developed and implemented clinical indicators to improve quality. Initial assessment. During this, clinical areas eligible for monitoring quality of care and roles of health staff working at various levels were identified. Choice of solution. Brainstorming discussion sessions were conducted to refine list of potential clinical indicators and to identify implementation problems. Implementation. It was implemented in four stages. (a) Self-explanatory tool of record, standard operating procedures and training manual were prepared during tools preparation stage. (b) Pilot implementation was done to monitor the usefulness of indicators, document the experiences and standardize the system accordingly. (c) The final selection of indicators was done taking into consideration points like data reliability, indicator usefulness etc. For final implementation, 15 indicators for district and 6 indicators for rural hospitals were selected. (d) Transfer of skills was done through training of various hospital functionaries. Evaluation and lessons learned. Selection and prioritization of clinical indicators is the most crucial part. Active participation of local employees is essential for sustainability of the scheme. It is also important to ensure that data recorded/reported is both reliable and valid, to conduct monthly review of the scheme at

various levels and to link it with the quality improvement programme.

Thompson, G. A. (1996). "Clinical indicators in colorectal surgery." Journal of Quality in Clinical Practice **16**(1): 31-35.
Two studies conducted in the state of Victoria have tested potential clinical indicators and the suggested thresholds for resection of colorectal carcinoma where an anastomosis has been performed. These studies involving 535 patients were independent of one another: one hospital based and one surgeon based. Threshold figures for these draft indicators have been compared with the study figures and found to be similar. It is suggested that wound infection (elective operation without formation of a stoma), anastomotic leak (clinically recognized) and mortality (elective operations in patients under the age of 30 years) are the most appropriate clinical indicators of colorectal resection for carcinoma.

Thomson, R. and J. Lally (1998). "Clinical indicators: Do we know what we're doing?" Quality in Health Care **7**(3): 122.

Travis, S. S., S. Moore, et al. (2005). "Clinical indicators of treatment futility and imminent terminal decline as discussed by multidisciplinary teams in long-term care." American Journal of Hospice & Palliative Medicine **22**(3): 204-210.
Focus group methodology was used to describe how members of multidisciplinary teams in long-term care facilities recognize when residents are approaching end-stage disease, document evidence that associated treatment futility has occurred, and convey this information to the residents, each other, and family members. In addition to the typical clinical indicators of treatment futility found in the literature (e.g., recurrent infections, weight loss, falls, functional decline), team members described a set of physical and affective changes that were apparent to them as their residents approached trajectories of imminent terminal decline. While more difficult to quantify and measure, these other indicators have a significant impact on the ways that team members assess and interpret a person's survival potential. Using these indicators of both treatment failure and imminent decline requires knowledge of a resident's history, clinical condition, course of care, and individual idiosyncrasies. Together, the indicators offer important cues that are needed for the identification of persons who might benefit from earlier transitions to palliative care.

Twomey, P. J., G. Rayman, et al. (2008). "Implications of different DCCT-aligned HbA1c methods on GMS clinical indicators." Diabetic Medicine **25**(1): 97-100.
BACKGROUND: In 2003, a new General Medical Services (GMS) contract was agreed between UK general practitioners and the Department of Health. The three diabetes codes DM5-DM7 require glycated haemoglobin (HbA(1c)) testing and comprise 30 points in total, with 27 points being related to target glycaemic control. We compared two routinely used Diabetes Control and Complications Trial (DCCT)-aligned HbA(1c) methods to determine if different HbA(1c) methods could lead to postcode treatment to target across the UK. METHODS: A total of 164 specimens were randomly selected from diabetic patients attending the Diabetes Centre at the Ipswich Hospital. Samples were analysed on both a DCA 2000+ Analyser and a Variant II analyser. RESULTS: Despite a mean difference of only 6.5% between the two methods, 32 (19.5%) and 63 (38.4%) patient samples had an HbA(1c) < or = 7.4% with the Variant II analyser and DCA 2000+ Analyser, respectively. Thus, the two methods differed according to the DM6 GMS target by 31 patients, or 18.9% of the total number of patients in this study. The difference between the two methods was statistically significant with P < 10(-09) (McNemar's test). CONCLUSIONS: DCCT-alignment has improved the transferability of HbA(1c) values; however, it is not perfect. It is important that the limitations of current DCCT-aligned HbA(1c) methods are understood by health-care professionals and policy makers, as these may have important financial and clinical implications.

Tworek, D., M. Bochenska-Marciniak, et al. (2006). "Lack of correlation between exhaled nitric oxide (eNO) and clinical indicators of the disease activity and quality of life in mild and moderate asthmatics." Pneumonologia i Alergologia Polska **74**(4): 391-5.
The measurements of exhaled nitric oxide (eNO) are simple and useful method of assessment of inflammation in asthmatics' airways. One of the causes of its limited application in clinical practice is a number of factors influencing the results of measurements.

The aim of the study was to determine the usefulness of eNO measurements in assessing the inflammation in a heterogeneous, in relation to atopic and smoking status, group of patients. MATERIALS AND METHODS: 120 subjects suspected of having asthma participated in this study. During 2 weeks the patients noted daily asthma symptoms and daily use of rescue medication. After 14 days health related quality of life (HRQL) was determined by means of Asthma Quality of Life Questionnaire (AQLQ), eNO levels were measured and airways reversibility test was performed. RESULTS: Preliminary diagnosis of asthma was confirmed in 84 patients on the basis of positive result of airways reversibility test. Among them, 21 subjects (25%) were smokers and 60 (71.4%) were atopic. No correlation was found between eNO and daily asthma symptom score, daily use of rescue medication, percent of airway reversibility after beta2-agonist and HRQL. CONCLUSION: eNO measurements in a heterogeneous, in relation to atopic and smoking status, group of patients are of limited value in clinical assessment of asthma activity.

Upright, J., E. Helvig, et al. (1996). "Burn care outcomes and clinical indicators." Journal of Burn Care and Rehabilitation **17**(2): 17A-18A.

Verleye, L., P. B. Ottevanger, et al. (2009). "EORTC-GCG process quality indicators for ovarian cancer surgery." European Journal of Cancer **45**(4): 517-526.

Vertesi, L. (2000). "Clinical indicators of intracranial injury in head-injured infants." CJEM Canadian Journal of Emergency Medical Care **2**(1): 21-2.

Vlak, T. and I. Jajic (1992). "The effect of 6 months of treatment with Tauredon on clinical indicators in rheumatoid arthritis." Reumatizam **39**(1): 27-31.
The objective of this research has been to evaluate the efficacy of Tauredon (the aqueous solution of Na-thiomalate) on the development of some clinical parameters in patients with rheumatoid arthritis. The group being tested comprised 8 men and 35 women, their average age being 50, the average duration of their illness being 9.5 years. As regards the anatomic development stage of illness, the majority of patients belonged to stage 2 (62.8%), with no patients belonging to stage 4. During the continuous six-month application of Tauredon, the following parameters have been observed: the Ritchie index, the PIP extent of the fist joints and the morning stiffness span of the small fist joints. The evaluation of the six-month treatment with Tauredon has proved its positive effect on all clinical parameters, shown in the lower value of the Ritchie index, the lower PIP extent of the fist joints as well as the shorter morning stiffness span. Further, the Tauredon effect has been seen in suppressing the inflammatory activities and in restituting the joint functions in patients with rheumatoid arthritis.

Vlak, T. and B. Stambuk (1998). "Comparative study of the effects of auranofin and aurothiomalate on laboratory and clinical indicators in patients with rheumatoid arthritis." Reumatizam **46**(1): 7-19.
Is there any significant difference in the effect and tolerance of the gold salts applied peroral and intramuscular in patients with rheumatoid arthritis (RA)? 97 patients with RA have been included in the research. Group used auranofin perorally comprised 30 patients with RA, 25 women and 5 men. Their average age was 53.4 years, the average disease course was 9.06 years. Group used aurothiomalate parenterally comprised 30 patients with RA, 23 women and 7 men. Their average age was 52.5 years, the average duration of their illness being 10.87 years. Control group comprised 37 patients with RA, 27 women and 10 men. Their average age was 58.2 years, the average disease course was 8.3 years. They did not use any "second line drug" or corticosteroids. During a six-month (26 week) continuous application of the gold salts (perorally and parenterally) the following parameters were observed in regular intervals: the erythrocyte sedimentation rate, the hemoglobin level in the serum, the C-reactive protein. Ritchie index, the PIP extent of the fist joints and the morning stiffness span of the small fist joints. The tolerance of the gold salts has also been controlled. The results have shown that there is no any significant difference between two forms of the gold salts in patients with RA. The statistical processing of data indicated that auranofin and aurothiomalate have significant effect on all controlled parameters. As regard of the side effects, patients accepted aurothiomalate better than auranofin.

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risk factor management in patients with type 2 diabetes." Medical Care **46**(2): 133-141.

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Vourlekis, B. S., K. Bakke-Friedland, et al. (1995). "Clinical indicators to assess the quality of social work services in nursing homes." Social Work in Health Care **22**(1): 81-93.
Nursing home social work service providers (n = 209) evaluated a proposed set of clinical indicators developed by an NASW Work Group to use in measuring social work performance in that setting. Practitioners rated all of the indicators highly for clarity, relevance, and meaningfulness to service provision. Problems with feasibility of use were identified for two of the indicators. Perceived difficulties in implementation are identified and addressed. A rationale is presented for the utility for nursing home practice of a uniform, professionally validated set of performance indicators as a component of quality improvement efforts.

Watkins, R. E., A. J. Plant, et al. (2005). "The association between subjective and clinical indicators of health in prospective Vietnamese migrants." Asia-Pacific Journal of Public Health **17**(1): 46-50.
We conducted a cross-sectional survey of 1669 prospective Vietnamese migrants who had applied to migrate to Australia to describe the association between self-reported health status and several commonly used clinical indicators of health among prospective Vietnamese migrants. Participants were recruited from the International Organization for Migration's standardised medical screening program.' We found that clinical indicators of health are related to self-reported health status among prospective Vietnamese migrants. Self-reported health status, which was assessed using a modified version of the Short Form-36 health survey, was significantly associated with clinical indicators of health, including the number of body system abnormalities identified during medical screening, evidence of tuberculosis on chest radiograph, and self-reported weight loss over the previous six months. These findings support the validity of self-reported health status assessment among prospective migrants, although the assessment of subjective indicators of health during compulsory medical screening may be limited by reporting bias.

Watson, R. (2009). "Commentary on da Silva VM, de Oliviera Lopes MV, de Araujo TL, Ciol MA, de Carvahlo EC (2009) Clinical indicators of ineffective airway clearance in children with congenital heart disease. Journal of Clinical Nursing 18, 729-736." Journal of Clinical Nursing **18**(5): 775-775.

Weeks, W. B., A. N. West, et al. (2008). "Comparing measures of patient safety for inpatient care provided to veterans within and outside the VA system in New York." Quality & Safety in Health Care **17**(1): 58-64.

Wijesingha, S. and S. Graham (2007). "Evidence behind the WHO guidelines: hospital care for children. What are the clinical indicators of PCP?" Journal of Tropical Pediatrics **53**(1): 4-7.

Williams, A. D. (1991). "Development and application of clinical indicators for nursing." Journal of Nursing Care Quality **6**(1): 1-5.

Winkler, M. F. (1995). "Clinical indicators for nutrition support." Topics in Clinical Nutrition **10**(4): 17-24.
The clinical indicator is an important measurement tool for quality improvement plans. Indicators for nutrition support should focus on high-risk, high-volume, or problem-prone areas of patient care. Outcome measures are increasing in their importance, yet processes, as illustrated by standards of practice and practice guidelines, provide the framework for indicator development. Nutrition support-related indicators can address any part of the nutrition care process. Examples are provided for nutrition screening and assessment, indications for therapy, timeliness of intervention, appropriateness of prescription, adequacy of intake, laboratory monitoring, management of complications, education, and discharge planning. Dietitians are challenged to engage in outcomes research that couples clinical and financial data collection.

Wollersheim, H., R. Hermens, et al. (2007). "Clinical indicators: development and applications." Netherlands Journal of Medicine **65**(1): 15-22.
Clinical indicators give an indication of the quality of the patient care delivered. They must comply with highquality standards and should be constructed in a careful and transparent manner. Indicators must be relevant to the important aspects of quality of care. There should be adequate research evidence that the recommendations from which they are derived are related to clinical effectiveness, safety and efficiency. They should measure the quality in a valid and reliable manner with little inter- and intra-observer variability so that they are suitable for comparisons between professionals, practices, and institutions. Indicators are selected from research data with consideration for optimal patient care (preferably an evidence-based guideline), supplemented by expert opinion. In the selection procedure, the feasibility, such as their measurability and improvability, is important beside validity and reliability. A clinical indicator should be defined exactly and expressed as a quotient. After a try-out, the measurements and reporting should follow. The report contains an in-depth analysis of causal and contributing factors associated with the measured results. A description of the clinical circumstances and a correction for case mix should be included to allow for a justified interpretation. The indicators must be part of an improvement strategy, for which comparison feedback is often used. We give examples of indicator development and applications in oncology, diabetes care, and the use of antibiotics for treating pneumonia. We explain how comparison with reference data can be used to construct improvement programmes.

Wootton, R., H. Gramotnev, et al. (2009). "A randomized controlled trial of telephone-supported care coordination in patients with congestive heart failure." Journal of Telemedicine & Telecare **15**(4): 182-6.

Yazaki, Y. (2005). "Using clinical indicators to improve the quality of medical care." Japan Medical Association Journal **48**(8): 432-433.

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Zinn, J. (1998). "Use of delphi panel method to develop consensus on laboratory performance indicators." Clinical Laboratory Management Review **12**(2): 97-105.