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Outcomes of evidence-based clinical practice guidelines: A systematic review

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Objectives: This study aimed to investigate whether evidence-based clinical practice in health care improves outcomes for patients, personnel, and/or organizations.
Methods: A systematic review of studies was conducted with various quantitative and qualitative methods up to the Spring of 2002. Protocols were used in quality assessment. Data synthesis is descriptive in a narrative form.
Results: Of 305 assessed articles, eight studies were included. The outcomes in the included studies were related to the experiences of patients and personnel and to organization concerning changed patient care and resource utilization. Because the included studies are heterogeneous in design, focus of research area, and scientific quality, the scientific foundation for the findings is weak. There is some support that evidence-based clinical practice guidelines, when put to use, improve outcomes (i) for patients—less likelihood of showing worsening of skin condition and disruption of skin condition improves more rapidly for infants; (ii) for personnel—support in daily work situation; and (iii) for organizations—decreased admission rates and length of stay, less resource utilization and reduced costs.
Conclusions: There is a need for further research as the findings are based on a rather limited number of studies. There is a tendency toward support for the idea that outcomes improve for patients, personnel, or organizations if clinical practice in health care is evidence-based, that is, if evidence-based clinical practice guidelines are used, although these findings could be specific to the settings and context of the studies reported in this systematic review.

Keywords: Evidence-based medicine, Professional practice, Health care, Review literature

A growing interest in evidence-based health care (EBHC) has been demonstrated by several kinds of health-care professionals since Sackett et al. (23) stated "the practice of evidence-based medicine means integrating individual clinical expertise with the best available external clinical evidence from systematic research" (p. 2). There are two main ways in which research evidence can be used: (i) to improve clinical practice and (ii) to improve health service management (9). EBHC and clinical guidelines aim to promote effectiveness and, thereby, improve quality (6). One way to provide EBHC is to use clinical practice guidelines that aim at reducing inappropriate variation in practice (26). In a systematic review including eighteen studies and involving more than 467 health-care professionals, the authors identified and assessed studies of the introduction of clinical practice guidelines in nursing, midwifery, and other professions allied to medicine. They conclude that there is some evidence that guideline-driven

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care is effective in changing the process and outcome of care. Grimshaw and Russel (10) investigated the effect of clinical guidelines on medical practice. They conclude that explicit guidelines do improve clinical practice when introduced in the context of rigorous evaluations. However, the size of the improvements varied greatly. Neither of these two reviews (10;26) considers whether the clinical guideline used is evidence-based.

There are many approaches to change clinical care and to implement guidelines. Depending on what the changes aim at, the target group, the clinical setting and the barriers and facilitators found, many of these approaches could have some value and may be effective (11). In a study aimed at determining which attributes of clinical practice guidelines influence the use of guidelines in decision making in clinical practice, it was demonstrated that evidence-based recommendations were used more than recommendations for practice that were not based on research evidence (12). The interventions that are shown to be effective to promote a tendency toward change in clinical practice are educational outreach visits, reminders, multifaceted interventions, and interactive educational meetings (1). The aim of this systematic literature review is to investigate whether evidence-based clinical practice in health care improve outcomes for patients, personnel, and/or organizations.

METHODS

Study Selection

In the process of specifying the assessment problem and determining inclusion criteria, a structure presented by Flemming (7) was used and the question at issue was "To what extent are outcomes improved for patients, personnel and/or organizations if clinical practice in health care is evidence-based?" This review explored the outcomes of evidence-based clinical practice in studies conducted with quantitative as well as qualitative methods. All categories of health-care professionals are included as well as any kind of health-care or clinical practice, hospital- or community-based. The interventions described in the retrieved studies should state in what way guidelines, practice, or decision making is evidence-based, that is, that the research are critically appraised and that considerations are made upon the strength of the evidence. Studies were included in this review if the outcome was measured in relation to (i) patients concerning health-related quality of life, mortality, morbidity, symptom score, functional status, self-care, experience of care; (ii) health-care professionals concerning experiences of work situation; and/or (iii) health-care organizations concerning cost-effectiveness, changed patients care, and resource utilization.

Literature Search

The literature search was carried out using standard methods and covered databases such as Medline (1985–March 2002), Cinahl (from start to Feburary 2002,), and the Cochrane Library (from start to April 2002). The search strategy in each database included terms covering the supposed content of the studies and the different types of study designs of interest combined with AND or OR. Search terms in Medline were, for example, "Evidence-Based-Medicine," "Health care category," "Organization and administration." Search terms in Cinahl were, for example, "Professional-Practice-Evidence-Based," "Program-Development," "Evaluation," "Professional-Practice-Research-Based," "Practice-Guidelines." Search terms in Cochrane Library were "Evidence-based medicine," "Practice guidelines," "Implementing" and "research," "Evidence-based" near "practice". The literature searches gave 2,824 references at the abstract level. These were reviewed by two independent reviewers. Considering the inclusion criteria, 298 references were regarded as possibly relevant for inclusion. The manual search in the articles' reference lists added fifteen references. Of the 313 references of which a full-text version was ordered, eight were not received for logistic reasons. Finally, 305 articles remained for assessment.

Quality Assessment

A protocol was used with the purpose of identifying relevant studies regarding the inclusion criteria. Each of the 305 articles was assessed for inclusion in the review by one of the authors (C.B.). Two independent reviewers (C.B., A.W.) made the final decision for inclusion. Discrepancies were discussed and resolved by data extraction from the study. Of the 305 articles, 10 were eligible for inclusion and 295 articles were excluded due to insufficient agreement with criteria of inclusion. Each of the ten included articles was reviewed by two independent reviewers (C.B., A.W.) with the purpose of establishing each study's level of evidence. The reviewers used protocols that focused on description and validation of study-design, diagnostics (if relevant) and intervention. Data were extracted regarding the size, precision, and tendency of the effects, also considering clarity, reasonableness, and soundness of results of studies using qualitative methods (8;13;14;19;28). The criteria for study quality concerning level of evidence were based on Britton, 2000 (2); SBU, 1999 (24); and Willman and Stoltz, 2002 (28); and were formulated as high (I), moderate (II), and low (III).

Data Synthesis

Because the included studies were heterogeneous regarding the overall designs and kind of measurements used, the data synthesis is descriptive in a narrative form. The level of evidence for each study was the foundation for establishing the strength of evidence concerning the grades of recommendation (see Table 1), following SBU–The Swedish Council on Technology Assessment in Health Care (2); modified after

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Table 1. Strength of Evidence Concerning Grades of Recommendations[a]

Grade 1: Strong scientific foundation	Grade 2: Moderate scientific foundation	Grade 3: Limited scientific foundation	Grade 4: Insufficient scientific foundation
At least two studies with high level of evidence, or one systematic review/meta-analyses with a high level of evidence.	One study with high level of evidence and at least two studies with moderate level of evidence.	One study with high level of evidence or at least two studies with moderate level of evidence.	One study with moderate level of evidence and/or studies with low level of evidence.

[a] Grades of recommendation are used in cases of congruence of studies; if there are divergences the grading becomes lower. Based on Britton (2, modified after Centre for Evidence-Based Medicine [4]; Scottish Intercollegiate Guidelines Network [25]).

Centre for Evidence-Based Medicine (4); Scottish Intercollegiate Guidelines Network (25).

RESULTS

The ten articles included eight studies (Table 2). They were published between 1995 and 2002 and conducted during the period 1994–1999. The overall designs of the studies differ; only Perlstein et al. (20;21) and Perlstein et al. (22) are of a similar design. It is not possible to draw any conclusions about improvement of outcomes from four of the studies due to small populations, short follow-up, large number of dropouts, unclear reporting of sites and time frames, and unclear relation to implementation of guidelines (3;5;17;27). The remaining four studies show improved outcomes in relation to (i) patients' experiences concerning less likelihood of showing worsening of skin condition and disruption of skin condition improving more rapidly for infants (grade 3, see Table 1) (15;16), (ii) personnel's experiences concerning support in daily work situation (grade 4, see Table 1) (18) Table 3, (iii) organizations concerning decreased admission rates, length of stay, less resource utilization, and reduced costs (grade 4, see Table 1) (20–22), Table 4. In our analysis, the strengths of evidence concerning grades of recommendations are weak.

Outcomes in Relation to Patients' Experiences

In a well-conducted prospective study that evaluated the effectiveness of a clinical practice guideline for neonatal skin care, the results showed that disrupted skin conditions improved more rapidly after implementation of the guidelines and that infants were less likely to show worsening of skin condition scores (15;16). This study was a large multicenter study from 51 sites located all over the United States, with 4,755 registered nurses assigned to all participated units. There were 65 nurses attended as site coordinators and a total of 2,820 infants, and 11,468 observations were performed. In addition to measure of symptom score in infants, skin care knowledge in site coordinators as well as skin care practice in relation to guidelines, care, and treatment given were also measured, which demonstrated increased knowledge and adherence with guidelines.

Outcomes in Relation to Personnel's Experiences

In a qualitative study, Marshall et al. (18) focused on how practitioners experienced the process of implementation concerning guidelines for the management of venous leg ulcer. The result illuminated the obstacles for changing practice in relation to lack of skills, expertise and resources, patients' ability and willingness to comply, as well as the gaining of new skills and knowledge and ways of identifying areas that were in need of improvement. The result also pointed out a positive impact in that the guideline ensured consistency and promoted a team approach. The practitioners' attitudes to and perceptions of guidelines were positive, regarding the guidelines as a support in the daily work situation.

Outcomes in Relation to Organization

In a prospective study that also included a historical control group, the results showed that, after implementation of a guideline for inpatient care of infants with bronchiolitis, there were significant changes in decreased yearly admission rates, length of stay, use of β^2-agonist inhalation, nasopharyngeal washes, x-rays, blood gas, antibiotics, and costs (20;21). In a similar study, Perlstein et al. (22), after implementation of guidelines for care of children with acute gastroenteritis, showed a nonsignificant decrease in emergency department encounters, admission rates, and costs and a significant change in decreased mean length of stay and increased admission of children with moderate/major illness severity. Although there was a change in documentation of hydration status and discharge diet, this study failed to show guideline adherence (22). Even though both these studies (20–22) were well conducted with a fairly sufficient follow-up, one has to bear in mind the limitations that follow with comparisons of populations that are not concurrent in time and uncontrollable confounding factors. Factors such as other changes made at the hospital or community that could have had an impact on, for example, costs and admission rates. Such matters are most likely influencing the possibility to generalize from these studies. In conclusion, even though the scientific foundation is limited, it seems the use of evidence-based guidelines

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Table 2. Included Studies

Author/country	Situation/area	Population	Study design/quality assessment
Button et al. (3) UK	Guidelines for promotion and management of continence by primary health-care teams in general practice.	Patients who suffered from incontinence. n = 174	CTP/II before/after implementation
Dufault & Willey-Lessne (5) USA	Use of research-based clinical pathways in management of cancer pain, acute and traumatic pain, and low back pain.	Surgical and oncology patients with a history of pain in the month before hospitalization. n = 239	CCT/III
Lund et al. (15) Lund et al. (16) USA	Effectiveness of an evidence-based clinical practice guideline for neonatal skin care in neonatal intensive-care units, special-care units and well-baby nurseries.	51 sites located throughout USA. 65 nurses. n = 2,820 infants	CTP/I before/after implementation
Manangan et al. (17) USA	Use of guideline for prevention of nosocomial pneumonia and its impact on the occurrence of ventilator-associated pneumonia at selected hospitals.	Hospitals participating in the National Nosocomial Infections Surveillance System. Infection control professionals. n = 179 hospitals	CTR/II before/after publication of guidelines
Marshall et al. (18) UK	Implementation of an evidence-based clinical guideline for the management of venous leg ulcer, and a process analysis of the intervention used in general practice.	Primary health teams; district nurses, practice nurses, general practitioners. 13 general practice in the NHS Northern and Yorkshire Region. n = not reported	Qualitative study with thematic analysis/II
Perlstein et al. (20) Perlstein et al. (21) USA	Implementation of an evidence-based guideline for the inpatient care of infants with bronchiolitis at the Children's Hospital Medical Center in Cincinnati, Ohio.	Records from guideline-eligible patients were collected. n = 1,979 patients	CTP + historical control/II before/after implementation Follow-up after 1 + 2 years/II
Perlstein et al. (22) USA	Implementation of an evidence-based guideline for the care of children with acute gastro-enteritis at the Children's Hospital Medical Center in Cincinnati, Ohio.	Records from guideline-eligible patients were collected. n = 11,493 patients	CTP + historical control/II before/after implementation
Tranmer et al. (27) Canada	Nursing research utilization strategy for staff nurses in a neonatal intensive-care unit.	Staff nurses working at the neonatal intensive-care unit. n = 64	CTP/ III before/after project

CTP, clinical trial prospective; CCT, controlled clinical trial; CTR, clinical trial retrospective; I, high; II, moderate; III, low; NHS, National Health Service.

can improve outcomes in relation to organizations in the sense of decreased admission rates, length of stay, and less resource utilization, which reduces costs.

DISCUSSION

The findings show a tendency toward support for the idea that an evidence-based clinical practice, constituted by the use of evidence-based clinical practice guidelines, improves outcomes for patients, personnel, and organizations. Caution is needed to interpret and generalize the findings to other settings than those studied. All but one of the studies that are the foundation for the conclusions are from the United States and they describe settings in neonatal and infant care (15;16) and at one children's hospital (20–22). Concerning improved outcomes for personnel, the included study is from the United Kingdom and the setting is primary health care (18). It is possible that the findings are specific to the settings and contexts of each of the studies. There is a need for further research to strengthen the findings and make the scientific foundation for improvements in outcomes for patients, personnel, and organizations sufficient. Presumably, the relevant outcomes should be of importance for patients, such as health-related quality of life, mortality, morbidity, symptom score, self-care, experiences of care, and life situation.

To examine professional behavioral change and the effectiveness of guidelines, the "golden standard" in designing studies is randomized control trials (RCTs) in which the units

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Table 3. Outcomes in Relation to Patients' and Personnel's Experiences

Authors Lund et al. (15), Lund et al. (16)	Authors Marshall et al. (18)
Data acquisition Twice weekly skin assessment tool.	*Data acquisition* Group interviews in each practice focused on practitioners' attitudes to and perceptions of the guidelines, audit, and critical appraisal training.
Results Skin condition scores neonatal intensive care unit/special-care unit sample: initial scores for all infants did not differ between pre- and postguideline groups. There were significant changes in neonatal skin condition score over time ($p < .0001$) and an interaction of group and time ($p < .0001$), indicating that infants with disrupted skin conditions improved more rapidly than infants with disrupted skin condition before use of guideline. Infants in the postguideline group were less likely to show worsening of skin score ($p < .05$). Skin condition scores well-baby sample: mean neonatal skin condition score was significantly lower in the postguideline group ($p < .05$). Postguideline group showed greater improvement in skin scores during observation period ($p < .03$). Preguideline group were more likely to have their skin condition worsen ($p < .02$). The most common cause of skin breakdown was diaper rash, but incidence was significantly reduced in postguideline group ($p < .01$).	*Results* A list of categories (not reported) was collapsed into four major themes. Benefits and problems of critical appraisal workshops: Successfully provided participants with the skill and knowledge to appraise and evaluate the quality and usefulness of research findings. Physicians valued the applicability of this training to other aspects of care. Nurses wanted discussion about the practical issues of getting the guidelines implemented. Both physicians and nurses expressed that they wanted a concerted action plan to take back to their practices. Responses to audit feedback: Feedback of audit results and comparison with others warranted interventions which helped to identify areas of practice which could be improved. Poor initial audit results were perceived to be a result of poor recording rather than lack of good-quality care, other reasons were the age of patients and comorbidity, which was linked to compliance and the low priority these patients ascribed to the healing of their leg ulcer. For most practices, the audits motivated them to changes to comply with the guidelines or to improve recording of care already being given. For a minority with good initial results, they produced the opposite effect. PHCT's responses to NEBPINY guidelines; barriers and sustaining factors to guideline implementation: The guidelines were perceived to provide a systematic framework to supplement practitioners' clinical judgment. They ensured consistency and promoted a team approach to care. They served as confirmation that good care was provided. Guideline compliance in itself is insufficient if expertise and skills are limited. The lack of opportunity for nurses to undertake Doppler training, compression bandaging required special skill and training and problems with gaining access to Doppler machines and bandaging systems. Patients' compliance with the recommended treatment remained as a major barrier. The impact of facilitation: Prompt practices to implement actions agreed at the previous meetings when they knew that another visit was due. Raised questions about the sustainability of practice developments when the research project end.
Comments Data collection was made by site coordinators who also facilitated implementation of guideline. It is not clearly reported when the postguideline assessments were made.	*Comments* Not clear about the interview technique, analysis procedure or in what way a high level of agreement was achieved between analyzers.

PHCT, Primary Health Care Team; NEBPINY, The Network for Evidence-Based Practice in the Northern and Yorkshire Region.

of randomization and allocation are the provider (26). One example of this type of design has been conducted by Network for Evidence-Based Practice In Northern and Yorkshire (NEBPINY; unpublished data, 2001). This trial is randomized by practice, and the aim was to estimate effects of a multifaceted program to implement evidence-based practice on the recorded process of primary-care and patient-assessed outcomes related to three study conditions—stable angina, asthma, and leg ulcers. The trial was not included in this systematic review because it was not yet published and the draft still lacked information in some of the study sections. It is an interesting trial, and it has the potential to be of

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Table 4. Outcomes in Relation to Organizations

Authors Perlstein et al. (20), Perlstein et al. (21)	Authors Perlstein et al. (22)
Data acquisition Hospital financial and clinical computer systems. Medical records.	*Data acquisition* Hospital financial and clinical computer systems. Medical records.
Results Admission rates: During the periods in the four years before implementation, yearly admissions for bronchiolitis ↑ at an average rate of 15%/year for a total ↑ of 52%. After implementation admission ↓ 29% in 1997, 21% in 1998, 23% in 1999, for a total drop of 56%. Median yearly admissions: change %: ↓ 30 ($p < .001$). Readmission rates: Readmissions to hospital in 10 days after discharge remained statistically stable, before: 3%, after: 3%. Length of stay (LOS): change %: ↓ 17 ($p < .001$). Use of β^2-agonist: one inhalation changes %: ↓ 17 ($p < .001$), multiple doses changes %: ↓ 28 ($p < .001$). Respiratory assessment form was used for fewer than 10% of cases. This held true even when an admission order sheet prescribing the use of this scoring instrument was signed by the physician. Use of nasopharyngeal washes: changes %: ↓ 52 ($p < .002$). Use of x-rays: changes %: ↓ 14 ($p < .001$). Use of blood gas: ↓ from 9%–13% before to 5%–12% after ($p < .001$). Use of antibiotics: change %: ↓ 12 ($p < .001$). Hospital costs: mean total costs change % ↓ 14 ($p < .001$), mean costs for ancillary resources change %: ↓ 41 ($p < .001$), mean costs for use of respiratory care services alone change %: ↓ 72 ($p < .001$). Guideline use: Guideline admission order was signed for eligible infants in 1997: 67%, 1998: 71%, 1999: 70%.	*Results* ED encounters: mean yearly total encounters % change: ↓ 23 (p 0.07, ns), mean ED admission % change: ↓ 13 (ns). Admissions: mean yearly admissions % change: ↓ 33 (p 0.12, ns), mean of children admitted with moderate/major illness severity % change: ↑ 89 (p .002). Length of stay: total inpatient days/year % change: ↓ 43 (p 0.07, ns), mean length of stay % change: ↓ 19 ($p < .0001$), mean length of stay, mild illness % change: ↓ 21 ($p < .0001$), mean length of stay, moderate/major illness % change: ↓ 5(ns). Hospital costs: total costs, ED + inpatients/year % change: ↓ 29 (ns), total inpatient costs/year % change: ↓ 32 (ns), mean costs, ED + inpatients % change: ↓ 4 (0.06, ns), mean inpatient costs % change: ↑ 2 (ns). Documentation of hydration status: before; in 1997 15%, after; 1998 ↑ to 63%, 1999 ↑ to 86% ($p < .001$) (in line with guidelines). Body weights: beyond a weight obtained at the time of a first encounter in ED or at admission, weight was only infrequently found (not in line with guidelines). Discharge diet: before; in 1997 an advance to regular diet by the time of discharge had been noted in 5%, after; 1998 ↑ to 23%, 1999 ↑ to 76% ($p < .0001$) (in line with guideline). Guideline use: 1998; a pre-printed guideline order sheet was signed for 3%, 1999; 35% contained signed pre-printed guideline Admission orders, 14% contained physician's orders.
Comments No reports about dropouts or difficulties in data collecting, although this is done from computed records or charts. Use of guideline admission order was high, but the respiratory assessment form was used in very few cases. It is not clearly reported what kind of data are the foundation for the calculation of costs.	*Comments:* No reports about dropouts or difficulties in data collecting, although this is done from computed records or charts. Failed to show guideline adherence although there was a change in documentation of hydration status and discharge diet, but not regarding recording body weights. It is not clearly reported what kind of data are the foundation for calculation of costs.

↓, decrease; ↑, increase; ns, not significant; ED, emergency departments.

inspiration for further research. The qualitative study by Marshall et al. (18) was conducted as a parallel study to the RCT by NEBPINY, to investigate the practitioners' perception of the guideline program. This knowledge is of importance to facilitate the implementation of evidence-based clinical guidelines in the best way.

In this systematic review, one of the inclusion criteria was that the included study should explain in what way the clinical practice could be assumed to be evidence-based, that is, critical appraisal of research results and consideration made upon the strength of evidence. Among the excluded studies there are examples that fail to demonstrate this. If the excluded studies had been further analyzed it is not likely that any of them would have made a profound change to the result of this review due to the fact they did not fulfilled the inclusion criteria. The inclusion criterion about evidence-based clinical practice proved to be one of the most important criteria for inclusion or exclusion in this systematic review. Because the answer to the question at issue should tell something about outcomes in a clinical practice that was evidence-based, there had to be a way to explore this. The choice to limit the criteria to a description of critical appraisal of research and considerations made upon the strength of evidence was taken under the assumption that EBHC will improve critical thinking. This might seem like a rather strict way of defining EBHC, but it is important to separate EBHC from research utilization, which do not always include critical appraisal.

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Policy Implications

Much of health-care provision is done under uncertainty. The whole movement toward EBHC tries to limit and reduce this uncertainty by assessments of the outcomes of different options for health care. It is important then that the policy and practice of EBHC is monitored and continuously assessed. It is common among researchers to conclude that more research is needed; however, this is precisely the implication of the findings in this study.

CONCLUSION

As mentioned, there is a need for further research as the findings are based on a rather limited number of studies. We found a tendency toward support for the idea that outcomes improve for patients, personnel, or organizations if clinical practice in health care is evidence-based, that is, if evidence-based clinical practice guidelines are used, although these findings could be specific to the settings and context of the studies reported in this systematic review.

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