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Review

Reviewing the impact of computerized provider order entry on clinical outcomes: The quality of systematic reviews

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ABSTRACT

Purpose: Computerized provider order entry (CPOE) is central to current efforts at improving clinical care. Understanding the quality of the evidence for CPOE is important to the practical decision of implementation, patient safety and future design efforts. This paper presents the results of a systematic analysis of the quality of systematic reviews of empirical CPOE research.

Methods: The systematic search process included PubMed, CINAHL, Scopus, Cochrane, INSPEC, and PsychInfo databases from the years 1987–mid 2010 in English only. All reviews with a focus on CPOE, electronic ordering, Electronic Health Record, or Health Information Technology were included. Studies were excluded if they did not mention a systematic review in the title or text, report a formal search process, report results of the search, or specifically include a separate section on CPOE in the results. Quality was assessed using systematic criteria developed by Oxman and Guyatt, QUOROM, and PRISMA. All three authors conducted the reviews independently. Disagreements were resolved through discussion. Descriptive data was extracted.

Results: The search process yielded 185 initial unique references with 13 final reviews meeting the inclusion criteria. The rating of overall quality in the Oxman and Guyatt scale averaged 4.9 out of a possible 7 and the average mean of the sum of the other questions was 5.69. The overall QUOROM/PRISMA ratings averaged 63% completion and ranging from 45% to 81%.

Conclusions: The quality of these reviews were moderate. Only one study conducted a full quantitative synthesis, and overall heterogeneity was reported as very high in the 3 studies that measured it. Recommendations emphasize clarifying the phenomenon of CPOE by avoiding reporting conclusions across sub-group analyses, increasing emphasis on the development of theoretical models, including more quantitative assessments, and increasing breadth of outcomes.

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1. Introduction

Valid information regarding the benefits and harm of Computerized Provider Order Entry (CPOE) is an essential requirement for establishing the basis of evidence for wider adoption [1]. The debate over the quality of evidence has increased due to recent reports of harm, lack of expected effects, and unanticipated consequences of CPOE and other Health Information Technology (HIT) technologies [2–5]. The debate extends beyond issues of research design and reliable measurement to a more global discussion of the causal and generalizable mechanisms associated with use of HIT generally and CPOE specifically. The task of establishing evidence is distinct from a dichotomous determination about whether CPOE is beneficial or not (a general consensus exists that it is), but rather understanding of how, when, for whom, and under what conditions the effects of CPOE are incurred. These are questions of research generalizability. Thus, the purpose of this paper is to review the quality of systematic reviews of CPOE to contribute to the overall question of research generalizability.

Systematic reviews include meta-analyses qualitative, narrative syntheses. They use structured methods to minimize bias found in a single study and to translate evidence across settings, populations, and time. A systematic review is the most general term and could include both quantitative and qualitative primary studies but uses accepted and rigorous methods for searching, determining relevance, and extracting data. A systematic review includes a clearly stated question, a systematic search with specific inclusion criteria, assessment of the validity of the findings of included studies, and a systematic presentation of study characteristics [6–9]. A meta-analysis is now thought to be a special category of systematic review in which a quantitative aggregation of effects is attempted [7]. The results of a systematic review (whether a meta-analysis or not) can be used to inform policy and drive future research agendas. The number and quality of systematic reviews is, therefore, key to scientific progress in any domain. In this paper we focus on quantitative reviews.

Systematic reviews are a key component of the scientific process. Individual studies are, in many ways, a single sample of $n = 1$ from a larger population of theoretical studies asking the same question. Systematic reviews play an integral and important place in the scientific community to move science into practice and advance theory. Examining the quality and characteristics of reviews provides researchers a larger "meta" view of the state of the science in the field as a whole.

The number of systematic reviews on CPOE has increased dramatically in the last 10 years. However, the procedures used for searching and aggregating studies vary greatly. To date, a systematic analysis of the quality of reviews for CPOE is not available, although several authors have noted that HIT reviews often suffer because of the low quality of primary articles [1,10,11]. The quality of systematic reviews and meta-analyses varies in other fields as well, even though it is improving [8,12,13]. The timing is optimal to examine the quality of reviews on the critical topic of CPOE and related outcomes.

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