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Abstract

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Reference


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A Scoping Review of Physicians’ Clinical Reasoning in Emergency Departments

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Study objective: Clinical reasoning is considered a core competency of physicians. Yet there is a paucity of research on clinical reasoning specifically in emergency medicine, as highlighted in the literature.

Methods: We conducted a scoping review to examine the state of research on clinical reasoning in this specialty. Our team, composed of content and methodological experts, identified 3,763 articles in the literature, 95 of which were included.

Results: Most studies were published after 2000. Few studies focused on the cognitive processes involved in decisionmaking (ie, clinical reasoning). Of these, many confirmed findings from the general literature on clinical reasoning; specifically, the role of both intuitive and analytic processes. We categorized factors that influence decisionmaking into contextual, patient, and physician factors. Many studies focused on decisions in regard to investigations and admission. Test ordering is influenced by physicians’ experience, fear of litigation, and concerns about malpractice. Fear of litigation and malpractice also increases physicians’ propensity to admit patients. Context influences reasoning but findings pertaining to specific factors, such as patient flow and workload, were inconsistent.

Conclusion: Many studies used designs such as descriptive or correlational methods, limiting the strength of findings. Many gray areas persist, in which studies are either scarce or yield conflicting results. The findings of this scoping review should encourage us to intensify research in the field of emergency physicians’ clinical reasoning, particularly on the cognitive processes at play and the factors influencing them, using appropriate theoretical frameworks and more robust methods. [Ann Emerg Med. 2019;●:1-12.]

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Scoping Review of Physicians’ Clinical Reasoning

Editor’s Capsule Summary

What is already known on this topic
Emergency physicians make hundreds of decisions each shift. Relatively little is known about how these decisions are made.

What question this study addressed
This scoping review sought to characterize the literature on medical decisionmaking to identify what seems to be known and what requires further research.

What this study adds to our knowledge
There is a paucity of research in most areas of clinical decisionmaking; experimental designs are rare. Although there is some evidence about how contextual factors such as emergency department crowding and fear of malpractice influence decisionmaking, there is little quality research in most regions of the clinical decisionmaking domain.

How this is relevant to clinical practice
Decisionmaking is a seminal part of emergency medicine practice. It would behoove the specialty and the public to better understand how emergency physicians make decisions.

MATERIALS AND METHODS

We present a summary of our methods below and invite interested readers to consult Appendix E1 (available online at http://www.annemergmed.com) for further details.

To answer our research question, we decided to conduct a scoping review, a type of knowledge synthesis used for the purposes of “summarizing and disseminating research findings” and “examining the extent, range and nature of research activity.”

Clinical reasoning is a complex topic, so we assembled a multidisciplinary team of researchers. The team included 6 clinical reasoning experts (T.P., M.-C.A., M.N., S.L., M.Y., and V.D.), 1 of whom is an emergency physician (T.P.), 1 pediatric emergency physician (L.H.P.), and 2 methodological experts (N.T. and A.T.). We followed the 5 steps recommended by Arksey and O’Malley, and by Levac et al, methodological frameworks that were recently discussed by Thomas et al in the context of health professions education. We summarized these 5 steps and how we performed them as follows.
In step 1, we identified the research question. To do so, T.P. and V.D. proposed an initial question that was discussed and refined with the rest of the team.

In step 2, we identified relevant studies. Our search was designed to capture the literature about clinical reasoning, by practicing physicians, and in the ED. Our librarian team member (N.T.) worked with 2 content experts (T.P. and V.D.) to select appropriate search terms (Appendix E2, available online at http://www.annemergmed.com). A series of pilot searches was conducted in MEDLINE to ensure that the final search would retrieve 10 key articles we had collectively identified. The final search was performed in June 2016 in MEDLINE (Ovid SP), EMBASE (Ovid SP), Education Resources Information Center (EBSCOhost) and PsycINFO (Ovid SP), with no date or language limits. The search was updated in June 2017.

In step 3, we selected the studies to be included in the review. We used an iterative process to define our inclusion and exclusion criteria. Our inclusion criteria were article reports primary research; article focuses on clinical reasoning processes (including diagnosis, investigations, and management, synonyms representing intuitive or analytic reasoning) or on physician, patient, and contextual factors influencing clinical reasoning; study refers to practice in the ED; and sample includes at least some practicing physicians. Our exclusion criteria were article reports on nonprimary research (case reports, commentaries, editorials, literature reviews); study refers only to practice outside the ED (during transfer, disaster sites, other ambulatory settings, and critical care unit); sample does not include practicing physicians (only patients, residents, nurses, or paramedics); study does not focus on clinical reasoning processes or influencing factors (eg, focuses on clinical reasoning accuracy only [with no analysis of process or influencing factors]; perception; decisionmaking about career choice; performance of technical skills; performance in communication, collaboration, professionalism; and attitudes towards decision making tools or guidelines); and study focuses on educational interventions.

The selection process occurred in 3 steps using a dedicated online software (Covidence; Veritas Health Innovation Ltd, Melbourne, Australia). First, 2 researchers (T.P. and V.D.) looked at the title and abstract of the articles and decided whether to include each study. They independently reviewed subsets of 50 studies until they reached agreement in at least 90% of cases (this threshold being considered a rule of good practice in scoping reviews). This level of agreement was reached after review of 200 abstracts. They then divided the remaining abstracts for review.

The second step consisted in reading the full texts. T.P. and V.D. independently read full texts in subsets of 25 articles until they reached an agreement level of 90%, which they did after reviewing 75 articles. The remainder of the articles were split between them.

In a third step, T.P. and V.D. involved the research team (excluding the methodological experts) to refine inclusion and exclusion criteria. In accordance with the revised inclusion and exclusion criteria, T.P. and V.D. reviewed the proposed full texts for inclusion independently. Remaining disagreements were discussed with the team (excluding the methodological experts) and resolved by consensus.

We retrieved 4,203 articles from the 4 databases in our initial search and 378 in our second search to update the database (Figure 1). After removing duplicates, we reviewed 3,763 abstracts and 837 full-text articles, of which we included 95 (Appendix E3, available online at http://www.annemergmed.com).

In step 4, we charted the data. T.P. and V.D. created the first version of the extraction form, relying on the theoretical framework, dual-process theory, described in the introduction (Appendix E4, available online at http://www.annemergmed.com). To refine the form, we asked the team (excluding the methodological experts) to independently extract data from 6 randomly chosen articles. We formed 2 teams of extractors (L.H.P. and S.L., and M.-C.A. and M.N.) and randomly assigned half of the articles to each team for independent extraction.

In step 5, we collated, summarized, and reported the results. For extraction of descriptive data such as country, methods or methodology used, population group, type of cognitive process mentioned, and step of decisionmaking (ie, diagnosis, investigations, or management), V.D. identified disagreements between the 2 extractors and computed the percentage of agreement for each question and for each pair of extractors (Appendix E5, available online at http://www.annemergmed.com). Disagreements were resolved by a third author (T.P. or V.D.). For open-ended extraction questions about the findings of each article, we kept responses from both extractors for analysis.

To characterize the database, V.D. conducted descriptive analyses of the responses to closed-ended questions, using IBM SPSS Statistics for Windows (version 23; IBM Corp., Armonk, NY). T.P. and V.D. independently analyzed the extracted data for open-ended questions, successively for cognitive processes, contextual factors, patient factors, and physicians’ factors.

For each of the topics listed above, T.P. and V.D. produced a narrative summary of themes following a deductive approach based on our theoretical framework (eg, searching in the “patient factors” topic results and summarizing findings based on age, sex, language,
culture/ethnicity, insurance status, medical history, signs and symptoms, patient expectations). They then discussed their respective narratives, returning to the extraction file and in some cases the original articles as needed to reach consensus. The team discussed the findings in a team meeting and through e-mail to select the most salient findings and discuss potential implications.

RESULTS

Of the 95 articles included in this review, most were published after 2000, with an upward trend in the number of publications over time (Figure 2). Characteristics of included articles are summarized in the Table. Two thirds of the studies were conducted in North America. In accordance with Punch and Oancea’s classification, we determined that the majority of studies used a nonexperimental quantitative approach (59%), with few experimental (9%) studies. Nonexperimental studies (n=56) typically used surveys (n=37), and most analyses were purely descriptive (n=39). The proportion of qualitative studies, which included 16 interview studies, 1 focus group study, and 3 studies combining several qualitative methods, increased from 0 before 2000 to 17% in the 2000’s and 27% after 2010.

Figure 1. Preferred Reporting Items for Systematic Reviews and Meta-analyses flow diagram showing the different steps of study selection. EN, English; FR, French.

Figure 2. Number of publications per year and proportion of quantitative, qualitative, and mixed-methods studies.
We present the thematic results according to the theoretical framework as described in the introduction. We will therefore first describe the findings from the review that discuss the elements relating to the clinical reasoning processes that underlie decisionmaking, and then findings relating to contextual factors, patient factors, and physician factors that influence clinical reasoning.

### Main Results

Few of the included articles specifically examined the cognitive processes underpinning decisionmaking (ie, clinical reasoning per se) (n=21 [22%], of which 4 publications were from the same research project).

Although some of these articles did not use the terminology of “dual-process theory,” 19 described both analytic and intuitive types of reasoning processes, 1 article described only intuitive processes, and 1 only analytic processes. Although clinicians self-report that they are more analytic than intuitive, studies found that experts (defined variably according to attending physician status, experience [eg, >5 or 10 years’ experience], or peer recognition) tended to use more intuitive processes than novices (typically defined as residents, fellows, or both, but sometimes less experienced attending physician staff).

Intuitive processes allowed them to generate diagnostic hypotheses very quickly, even before meeting the patient, and to form a first impression of the patient (specifically in terms of “well/unwell”), which influenced subsequent reasoning and decisions. First impressions were based on very little information, including nonverbal cues (eg, child is crying versus smiling). Three experimental studies found inconsistent results in terms of the role of intuitive processes on diagnostic errors. The study by Cruz et al using clinical vignettes found that ECG interpretation could be biased by adding information from the patient history. Mohan et al, in a serious game (a computer game designed for purposes beyond entertainment; in this case, for research) engaging participants in a simulated ED, found that increasing participants’ cognitive load led to undertriage of patients who were less representative of trauma patients requiring transfer, suggesting that increasing cognitive load triggered the use of a representativeness heuristic. However, Monteiro et al found that interruptions, which should lead to increased use of heuristics, did not lead to an increase in diagnostic errors on clinical vignettes. In addition to intuitive reasoning, experts also used analytic reasoning, specifically in atypical or life-threatening situations, using algorithms in the latter.
Within our database of included studies, 48 articles (51%) reported on contextual factors that might influence clinical reasoning.\textsuperscript{25,26,29,31-35,38,39,44,46-82} Admission rates were influenced by factors such as time of day,\textsuperscript{46} with conflicting results in regard to the influence of patient flow and workload.\textsuperscript{47,60} An experimental study found that high cognitive load increased reliance on intuitive reasoning.\textsuperscript{31} One study found that bed availability influenced patients’ length of stay in an observation unit.\textsuperscript{80}

Three studies examined the effect of interruptions.\textsuperscript{44,49,74} Two studies found that interruptions led to physicians’ engaging in a prioritization of the current task versus the task related to the interruption.\textsuperscript{49,74} This additional decision required mental processing that increased the overall cognitive load on physicians.\textsuperscript{19} One study found that interruptions increased the time taken to reach a decision but did not affect quality of decisions.\textsuperscript{44} Finally, loud intermittent sounds were found in an experimental study to increase stress, distraction, and speed of decisionmaking, with no effect on quality of decisions.\textsuperscript{50}

Physicians believed that test ordering was excessive.\textsuperscript{82} Investigations were used to rule diagnostic hypotheses in or out,\textsuperscript{8} even when they were very unlikely,\textsuperscript{82} but also at times to provide reassurance to the patient and to the physicians themselves.\textsuperscript{83} Multiple factors influenced test-ordering decisions, including fear of litigation,\textsuperscript{82,84,85} concerns about the cost to patients,\textsuperscript{83} and the scientific evidence (although one study suggested emergency physicians were less likely to base their test-ordering decisions on the evidence than other specialists were\textsuperscript{79}).

Forty-three publications (45%) included patient factors.\textsuperscript{25,26,32-34,56-38,45,46,48,52-56,58-61,73,78,81-83,86-96} Several studies found that physicians (and in one study, residents more so than attending physician staff)\textsuperscript{68} cited age as a factor they considered when deciding to withhold or stop resuscitation,\textsuperscript{63,67,78} although in one study, physicians cited physiological age as opposed to actual age as an important factor.\textsuperscript{26} and in another, physicians thought that age would not be a major factor in their decision to admit a patient brought to the ED in cardiac arrest.\textsuperscript{48} In one vignette study\textsuperscript{38} and in a study of actual cases,\textsuperscript{90} age was indeed a factor in withholding or stopping resuscitation. Mutrie et al\textsuperscript{66} found that physicians considered age in the decisions to admit and Ben-Assuli et al\textsuperscript{66} found that age increased the likelihood of being admitted. Finally, age was considered a complicating factor in communication, with physicians tending to order more tests because they were unsure of the accuracy of the history when the patient’s cognitive state was uncertain, or when they found it difficult to communicate with patients with hearing deficits.\textsuperscript{37,86}

Communication barriers such as language and cultural differences complicated history taking, reduced physicians’ confidence in the accuracy of the data from the history, and increased physicians’ diagnostic uncertainty.\textsuperscript{37,86} Physicians described ordering more tests when faced with communication barriers.\textsuperscript{37,86}

Gender was not consistently related to decisionmaking in our database and the evidence of gender bias was therefore weak. Men were more likely to be admitted\textsuperscript{56} and overtriaged for minor injuries,\textsuperscript{51} but they received analgesic prescriptions for pain management similar to those women received (except for severe pain, in which women were more likely to be prescribed analgesics).\textsuperscript{70}

Two studies examined the potential for ethnicity to bias clinical reasoning and found inconsistent results. James et al\textsuperscript{37,89} found that ethnicity influenced the types of questions physicians asked patients presenting with chest pain. Nonwhite patients were more likely to be asked about smoking and alcohol or cocaine use, suggesting that stereotypes about patient lifestyle may be present. On the other hand, in an experimental vignette study Tamayo-Sarver et al\textsuperscript{35} found that ethnicity did not influence opioid prescription.

Fifty-two studies (55%) included physician factors.\textsuperscript{26,27,32-40,44-46,48,51-55,57,58,61-63,65-68,70,72,73,75,79,81,82,85,87,88,91-94,96-104} Two studies in our database examined the effect of specialized training on admission rates. Specialized training was variably defined as completing residency that included emergency medicine training, or as completing a complementary specialty such as pediatric emergency medicine, or as having obtained a postgraduate emergency medicine–related certification. One study on pediatric emergencies found that general pediatricians’ patient admission rates were higher than those of pediatric emergency physicians,\textsuperscript{46} but Mutrie et al\textsuperscript{56} found no differences in general admission rates based on specialized training. Specialized training was, however, seen as making difficult decisions easier in trauma or end-of-life cases,\textsuperscript{26,51} although experience was seen as a more significant factor.\textsuperscript{51} Specialized training was also associated with physicians’ being even more favorable to analytic thinking than other emergency physicians were.\textsuperscript{54} Neither board certification nor experience influenced self-reported use or endorsement of shared decisionmaking.\textsuperscript{52,81}

Experienced physicians were more accurate in their diagnoses, especially in complex cases,\textsuperscript{33,39,44,45} and had lower patient mortality rates, especially in the most severe cases.\textsuperscript{35,96} They were not, however, any better at predicting survival in cases of acute congestive heart failure than more junior colleagues.\textsuperscript{92} Experience was generally associated with fewer investigations,\textsuperscript{51,86,87,96} although one study found no difference for number of laboratory test
requests. Findings were inconsistent in terms of admission rates. Li et al found lower admission rates for experienced physicians and Gaucher et al found lowest admission rates for physicians with 5 to 10 years of experience, followed by the most senior physicians, whereas Wu et al found higher rates of admission for more experienced physicians. Studies were also inconsistent in regard to speed, with 2 studies suggesting experienced physicians were faster and 1 study finding they were slower than junior colleagues. According to one study, experts had a broader sense of the clinical situation, could extract relevant cues from a wealth of information, and, although they came to a working diagnosis faster, were more likely to keep an open mind, whereas novices (in this study, first-year residents) struggled to identify relevant cues, relied more on objective and flagged abnormalities from investigations, thought more linearly, and tended to commit sooner to a diagnosis, making it harder for them to reconsider their diagnosis if disconfirming information became available. The fact that experts kept an open mind longer was consistent with a finding from an experimental study in which experts not only generated more and better diagnostic hypotheses than did residents but also generated their final diagnosis later. There were no differences in favoring analytic reasoning versus intuitive reasoning based on experience.

In our database, sex had no influence on admission rates of pediatric patients, on over- or undertriage of patients with injuries, on accuracy of survival judgments, on unscheduled revisits, or on attitudes to risk. However, one study found that women were more favorable than men in regard to intuitive reasoning (although both men and women reported using analytic reasoning more than intuitive reasoning) and were less likely than men to report using bleeding risk scores. One study found that women had attitudes toward shared decisionmaking similar to that of men, but another found that they had higher levels of self-reported use than men did.

Patients managed by physicians with a high level of risk aversion or concerns about malpractice were more likely to be admitted, particularly in ICUs, and underwent more testing, although 2 studies found that fear of malpractice and stress from uncertainty did not influence decisions.

LIMITATIONS

One of the challenges in reviewing the literature on clinical reasoning is a lack of consensus surrounding terminology, resulting at least in part from the diversity of theoretical frameworks used in the study of clinical reasoning and decisionmaking. For example, the Medical Subject Headings terms “decision making” or “clinical decision making” do not capture all relevant articles. To increase the sensitivity of the search, we included as many relevant key terms as possible and ensured that these terms identified the 10 key articles collectively identified by our team. However, we did not attempt to further validate the search by measuring the sensitivity and the precision of the search. Therefore, despite our inclusive search strategy and our broad inclusion criteria, we cannot rule out the possibility of having missed relevant articles. In particular, we are aware of several studies on the effect of context on the practice of emergency medicine, such as interruptions and noise, that were not retrieved. We hypothesize that these studies were not identified by our literature search because they did not specifically address the effect of these contextual factors on clinical reasoning. However, the purpose of a scoping review is not to be exhaustive, but to depict the breadth and depth of a body of knowledge.

In seeking breadth, we included articles that focused on specific diseases, symptoms, or syndromes. The findings from such studies point to factors of interest but cannot be assumed to generalize to emergency medicine practice as a whole. Furthermore, in seeking to describe the scope of the literature as opposed to proposing a synthesis of the best evidence, as in a systematic review, we did not evaluate the quality of studies.

Another issue in interpreting results was that the definition of expertise was ambiguous, with some authors using experience as the only marker for it.

Finally, we did not extract information about the use, or lack thereof, of a theoretical framework. Although few studies used an explicit theoretical framework, more detailed information might have been interesting.

DISCUSSION

Most of the studies included in this scoping review were published after 2000, reflecting a growing field of research in clinical reasoning in emergency medicine, in line with the 2006 Annals of Emergency Medicine call. In contrast to the general literature on clinical reasoning, which focuses mainly on the diagnostic step of clinical reasoning, most of the work included in this scoping review focused on the patient management step (including disposition, treatment, and follow-up plan). This result could be explained by the fact that management in emergency medicine (eg, decision to resuscitate or admit) must often proceed in the absence of a clear diagnosis.

Considering management as a key output of clinical reasoning places the emergency medicine literature ahead of
the broader clinical reasoning literature, in which explicit discussion of the reasoning underpinning management, including for patients with multiple chronic conditions, is currently understudied.

In our scoping review, few studies specifically focused on the clinical reasoning processes underpinning decisionmaking (ie, clinical reasoning per se). Those that did generally described both analytic and intuitive types of reasoning, which supports the relevance of dual-process theory, a theoretical framework commonly used in the broader clinical reasoning literature. We also found that physicians relied on knowledge based on their clinical experience when making decisions. In fact, experience—and presumably the experiential knowledge that it encompasses—had a stronger influence on decisionmaking than did specialized training. In the broader literature on clinical reasoning, intuitive reasoning processes are seen as developing through experience, which is consistent with some of the studies suggesting that experts rely on intuition more than novices.

The influence of context on reasoning has been recognized since the 1990s, and many studies have confirmed this influence in the field of medicine. Context is even considered by some authors as the most significant factor affecting clinical reasoning. Half of the studies included in our database examined at least one contextual factor. However, most of the studies examined only the effect of contextual variables on decisions per se rather than on the underlying cognitive processes. We suggest that further research examine in more detail the influence of context on clinical reasoning itself and believe that cognitive load theory may be a useful theoretical lens to examine the effect of contextual features of emergency medicine such as interruptions and noise. One feature of emergency medicine that was rarely mentioned in our database but is an emerging concept in the broader clinical reasoning literature is team-based reasoning. How the reasoning of a first agent (for example, the triage nurse or a paramedic) might influence the reasoning of a second agent (for example, the emergency physician) is an area of research associated with potentially important implications for emergency medicine, in which team-based care is commonplace. For instance, how can experts develop an effective “know-who” and judiciously make use of their colleagues’ reasoning without falling prey to anchoring bias? Studies aimed specifically at collaborative or team-based reasoning may improve our understanding of actual reasoning in the ED, which could contribute to increased quality of reasoning and hence decisions.

Changing one’s practice in relation to the threat of malpractice has been referred to as “defensive medicine.” It is associated with behaviors such as prescribing more unnecessary investigations or treatments, avoiding risky yet necessary procedures, excessively admitting patients or referring them to other specialists, or, in some specialties, refusing to treat high-risk patients. One would expect it to be prevalent in emergency medicine, which, despite average rates of malpractice claims, is typically perceived as a “risky” specialty.

In our database, most studies examining constructs related to risk aversion and fear of litigation showed that physicians who were more concerned about risk or litigation prescribed more investigations and admitted more patients. Although this issue may be more prevalent in North America, where litigation may be more prominent, and where many of the studies in our database were conducted, the role of attitudes related to risk taking merits further investigation.

One of the challenges in interpreting this body of literature is that different articles use different terms to study similar and related constructs, and different instruments to measure them. Future work in this area would benefit from semantic and conceptual clarity, and should provide more data about the validation of measurement instruments.

Several studies found that physicians considered patients’ age, particularly in admission decisions or when deciding whether to initiate or withdraw resuscitation. Whether they did so appropriately (ie, to accurately determine diagnosis or estimate prognosis) is beyond the scope of this article. The studies we examined were not designed to distinguish appropriate clinical management from ageism. Further research is warranted in this area, particularly in light of the increase in elderly patients in EDs.

Another factor affecting clinical reasoning in our database was communication. Whether it be language issues, patient hearing deficits, or concerns about patient reliability, emergency physicians rely heavily on the clinical history and resort to more investigations when they are unsure of its reliability. Further studies should examine cultural communication barriers in more detail because these are likely to also influence clinical reasoning.

We would like to conclude this article in 2 parts: first by summarizing the answer to our research question, and then by opening up additional research perspectives, particularly in terms of methodology. Considering our aim to examine the state of knowledge on how emergency physicians make decisions, our review revealed that cognitive processes are mobilized in a way similar to that of other specialties, with both analytic and intuitive processes in play. However, the context of emergency medicine practice and several physician factors (including fear of litigation and experience) and patient-related factors (including age and
language) play a determining role in the decisions that are made. In identifying factors that influence decisions, our review suggests that further research is needed to understand how these factors play a specific role in successful decisionmaking, as well as in errors. Such research could help design interventions to improve patient safety.¹²¹,¹²² The field of research on clinical reasoning in emergency medicine has been growing since the early 2000’s. However, further research is needed. In our review, most studies used a quantitative descriptive approach. Experimental studies were rare. We suggest they should be used more often; specifically, to examine biases linked to patient factors and to study the effect of specific contextual factors such as interruptions and noise. Qualitative research, particularly suitable for studying reasoning,¹⁰ represented only 21% of included studies, although the proportion has been increasing since the 2000’s. Recent qualitative research in the field of emergency physicians’ reasoning has contributed significantly to the understanding of complex decisionmaking mechanisms. Qualitative methods are especially useful to study clinical reasoning in complex natural environments and should be used to examine the interactions between clinicians, patients, and the ED environment.¹³ Finally, in line with quality criteria for research in medical education in general, we recommend that future studies be grounded in appropriate theoretical frameworks.¹²³,¹²⁴

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**REFERENCES**


16. Kroessop P. Context is everything or how could I have been that stupid? Healthc Q For Ont. 2009;12:e171-e176.


51. Galgardi AR, Nathens AB. Exploring the characteristics of high-performing hospitals that influence trauma triage and transfer. J Trauma Acute Care Surg. 2015;78:300-305.


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