Author’s response to reviews

Title: An educational game for teaching clinical practice guidelines to Internal Medicine residents: development, feasibility and acceptability

Authors:

Elie A Akl (elieakl@buffalo.edu)
Reem Mustafa (rmustafa@buffalo.edu)
Thomas Slomka (tslomka@buffalo.edu)
Alia Alawneh (alia_alawneh@yahoo.com)
Abhishek Vedavalli (abhishekvedavalli@yahoo.com)
Holger J Schünemann (hjs@buffalo.edu)

Version: 2 Date: 28 August 2008

Author’s response to reviews: see over
August 18, 2008

RE: “An educational game to improve Internal Medicine residents’ knowledge and adherence to clinical practice guidelines”

Dear Dr. Norton,

We thank you for the opportunity to revise our manuscript for BMC Medical Education. We found the reviewers’ comments very encouraging and their suggestions very helpful. Please find on the following pages our detailed point-by-point responses.

With kind regards,

Elie A Akl, MD, MPH
Department of Medicine, University at Buffalo
Reviewer: Roger Wong

Overall Comments
I approach the review of this manuscript with great interest and excitement. Educational games are commonly used in postgraduate medical education, and clinical practice guidelines (CPG) adherence is an important aspect of quality improvement and patient safety.

Thank you for the positive input.

Unfortunately, there are major areas that require significant revisions. The title of the manuscript is somewhat confusing as it implies the study endpoints to be knowledge improvement and CPG adherence, although in actual fact the endpoints are game feasibility and acceptability. Thankfully, the study question posed by the authors is simple and straightforward. However, there are major methodological and data weaknesses, which are detailed in the following sections. These must be fully addressed before consideration for publication. The Discussion is also not adequately supported by the data presented. The overall writing is clear and acceptable.

Thank you. We have considered all the comments and suggestions to improve the quality of the manuscript (see below).

Major Compulsory Revisions Title:
The wording should be changed to reflect the actual study endpoints, that is, substitute feasibility and acceptability for knowledge improvement and CPG adherence.

Thank you for the suggestion. We have changed the title to:

“An educational game for teaching clinical practice guidelines to Internal Medicine residents: development, feasibility and acceptability”

This title is now consistent with the study objectives:

“The objectives of this study were to develop an educational game to teach CPGs in Internal Medicine residency programs and to evaluate its feasibility and acceptability.”

Methods:
What was the sample size of residents? Why was this number chosen?

The sample size was 30 and was a convenience sample consisting of residents who attended at least one of the 4 weekly sessions during which we pilot tested the game. As the evaluation was
qualitative in nature, we did not conduct a sample size calculation. We have clarified these points in the text as follows:

“...and participants consisted of a convenience sample of 30 residents rotating at the training site at that time.”

We now mention this issue as a limitation of our evaluation:

“The evaluation of the acceptability of the game was limited by our use of a convenience sample of residents.”

How was the needs assessment done? And from what audience groups (that is, residents, faculty, etc.)?

We conducted a needs assessment at 4 levels:
(1) We reviewed the literature relating to the effectiveness of the different strategies used to improve the implementation of clinical practice guidelines (1st paragraph of the background section). The conclusions were that the different strategies had limited impact and that multifaceted and tailored interventions are likely more efficacious.

(2) We conducted two systematic reviews of the medical literature about the use of educational games in medical education.
- The 1st systematic review focused on health professionals and is published in the Cochrane Library:
- The second systematic review focused on medical students and we are about to submit the final report for peer review. The protocol of the review is registered with the Best Evidence Medical Education (BEME) Collaboration:

Both systematic reviews did not confirm nor refute the utility of games as a teaching strategy. However, they revealed the growing interest in educational games and the need for additional high-quality research to explore the impact of educational games on educational outcomes. We refer to these 2 systematic reviews in the 1st sentence of the 3rd paragraph of the background section.

(3) We conducted formal discussions with five internal medicine chief residents and two program directors attending the American College of Physicians (ACP) and the Association of Program Directors in internal medicine (APDIM) 2005 annual meetings. The discussions were part of a preparatory work for a national survey on teaching clinical practice guidelines. The focus was about strategies of teaching guidelines. The discussions confirmed the need to improve the teaching of guidelines and suggested that games would be an acceptable strategy worth exploring.
(4) We conducted informal discussions locally with the director, a number of faculty and 2 chief residents of our internal medicine residency program about the teaching of clinical practice guidelines. The discussions yielded an agreement that there is a need for additional teaching of guidelines.

We have added the following text to the 3rd paragraph of the background section that summarizes the results of the literature review:

“Formal and informal discussions with internal medicine residency program directors and chief residents at the national and local level revealed a need for additional strategies for teaching CPGs with an interest in educational games as a potential strategy.”

How were the endpoints (feasibility, acceptability) assessed? What measurement tools (structured or unstructured, standardized or non-standardized) were used? Were these validated or not?

Thank you for raising these important issues. We have now clearly separated in the methods as well in the results sections the evaluation of feasibility and acceptability.

The endpoints we evaluated for feasibility were: the integration in the curriculum, the functionality of the tool, the quality of the questions, and the rules of the game. For evaluating feasibility we conducted pilot testing sessions followed by feedback sessions that we now describe as follows:

“We pilot tested the Guide-O-Game© in order to evaluate its feasibility in terms of integration in the curriculum, the functionality of its tool, the structure of its questions, and the usability of its rules. We conducted four weekly sessions of the game at a hospital training site for the Internal Medicine residency program at the University at Buffalo. A senior resident (RM) doing an EBM elective run the sessions [11] and participants consisted of a convenience sample of 30 residents rotating at the training site at that time. Each session lasted 45 minutes and was followed by 15 minutes qualitative feedback sessions. The feedback consisted of answering in writing open ended questions followed by an open verbal group discussion. We improved each of the three components of the game (tool, questions, and rules) through an iterative process of pilot testing, feedback and revision.”

The endpoints we evaluated for acceptability were: interest in the educational strategy and engagement in the learning process. We evaluated acceptability as part of the feedback sessions as follows:

“The 15 minutes qualitative feedback sessions included questions about the acceptability of the game in terms of interest in the educational strategy and engagement in the learning process. We used the results of the evaluation after each session to improve the game prior the following session.”
Although the brief questionnaire was structured around the 5 points mentioned above, the answer options were open ended rather than standardized in order to stimulate discussion. The questionnaire was not validated. We now mention these issues as a limitation of the study design:

“Also because of the qualitative nature of the evaluation, we used a non-standardized non-validated measurement tool”

Why did the authors opt to modify the traditional Jeopardy game board and rules instead of using the traditional version which is widely known and accepted?

Thank you for the question. There are numerous similar shows and all have slightly different rules and tools. They are tailored to the audience and purpose, in particular in the international context. Therefore, we opted to design a game that would suit the medical context, perhaps on an international level. We now clarify this issue in the 2nd paragraph of the methods section as follows:

“We tailored the Guide-O-Game© in order to the specific context of residents and clinical practice guidelines and healthcare issues. Indeed, the pilot testing (see below) confirmed the need for such tailoring”

Initially we opted to refer to Jeopardy thinking it would be widely recognized. Now we refer to TV game shows in general in order to avoid any issues related to intellectual property. In order to make sure it is clear for the reader what Guide-O-Game© is, we describe in detail in the manuscript, Additional file 3 and the figures.

Has the Guide-O-Game© format been previously used and validated in a content area other than CPG?

No, to our knowledge this is the first description of such game in the medical context. Thus, this specific game format has not been previously used or validated in a content area other than CPG. We are currently planning for a controlled trial to investigate the effect of the Guide-O-Game on residents’ knowledge of clinical practice guidelines. We have noted this plan in the conclusion of the manuscript.

Results:
I would recommend moving the sections on “The multimedia interactive tool” and “The game questions and rules” to Methods.

Thank you for the recommendation. Based on the above suggestion to modify the title and on subsequent suggestions from the other reviewers, we found it helpful to restructure the text to highlight three distinct parts ((1) developing the game; (2) evaluating feasibility and (3) evaluating acceptability). This structure is now reflected in the title, objectives, subsections of the methods section, and subsections of the results section. For this reason we would prefer to split the development of the game between the methods section (describing the approach to developing the different components of the game) and the results section (describing the
different components of the game). We hope the reviewer considers this as a reasonable approach.

The reporting of resident feedback in the Results section was very brief. More details are necessary. For instance, at a minimum, please report the frequency of responses by themes.

We agree with the reviewer’s comment. We now provide more detail about the results of the evaluation of acceptability. As this was a qualitative type of assessment, we did not record quantitative data.

“Participants found the game to be an acceptable educational strategy. First, the game format raised the residents’ interest in guidelines recommendations which they described as “a dry material”. The interest further increased when we integrated a rationale for each recommendation in the game. Second, they felt playing the game is fun, especially when racing against time to select an answer and when the scores of the two teams were close. This helped them “relax a bit” during a time of the day when work pressure is high (sessions were run during noon conference time). Third, as a result of the fun and the increased interest, the residents reported being more engaged in the learning process in comparison with usual didactic lecture during which they become “easily distracted”. Fourth, while residents became actively engaged during the session there were some indicators that they might have also become actively engaged after the session. Indeed, one resident asked which CPGs were to be played the following week so she could “review them in advance”.

While participants found most of the questions relevant to their practice, they judged some of them as non-relevant. One example relates to the number of procedures a laboratory need to perform per year to be considered an appropriate percutaneous coronary intervention center. They also criticized not providing a rationale for each recommendation in the initial version of the tool. We did subsequently add such rationale which proved helpful in increasing residents’ interest. The residents finally recommended having a review period at the end of each session which we used for discussing some of the answers and rationales.”

Discussion:
The last paragraph in this section includes statements that are not supported by data presented in this paper. Specifically, please include what data from this or previous study that can demonstrate resident knowledge improvement on CPG by using an educational game.

Thank you for noting this. We agree with the reviewer that the statements, as they were worded, were not supported by data presented in this paper. In fact, and as mentioned above, we recently conducted a Cochrane systematic review on the effects of educational games on patient and performance outcomes. The findings of the systematic review did not confirm nor refute the
utility of games as a teaching strategy for health professionals. We therefore modified the discussion. The 1st sentence of the paragraph in question now reads:

“A recent systematic review did not identify good quality evidence to confirm or refute the utility of games as a teaching strategy for health professionals [7].”

We intended to use a less affirmative tone to suggest how the game, based on theoretical assumptions, could potentially improve residents’ knowledge. We now use a less affirmative tone by replacing “can” by “may” and have deleted the statements referring to assumptions that might not apply well in the case the Guide-O-Game (i.e., peer interaction, low risk environment).

How does peer interaction help with knowledge improvement? What is the evidence that this educational game provides a “low risk environment” (in fact, if used in competitive format, the environment is at least medium risk if not high risk)?

As noted above, we have deleted the statements referring to peer interaction and low risk environment because they might not apply well in the case the Guide-O-Game.

What is the data that shows competition can “incite residents to learn” and pre-read?

As above, we have made the tone less affirmative and used “may” instead of “can”. We have also added “theoretically” at the beginning of the sentence:

“Theoretically, the competitive nature of the Guide-O-Game© may also incite residents to learn the guidelines’ recommendations ahead of the following session in order to be able to win the competition.”

What is the data that demonstrates association between the quality of game design and resident knowledge improvement?

The quality of design is intended to refer to the study that is evaluating the game. We have modified the wording to make this idea clearer:

“However, only a trial of high methodological quality can demonstrate the true effect of the Guide-O-Game© on residents’ knowledge.”

Minor Essential Revisions
None.

Discretionary Revisions
None.
Reviewer: Jyothis George

The authors do need to be congratulated for this succinct description of development of a multimedia game prototype and feasibility. With interests in medical education as well as medical informatics, I should admit I found it an enjoyable read. However, there are a few areas where improvements can be made.

Thank you for the encouraging feedback.

All Minor Essential/Discretionary Revisions
1) It is not clear from the introduction or methods as to why a decision was made to develop a team based game rather than a ‘single user’ game. ‘Team based’ games are better than the single user in some respects and it is perhaps worth mentioning this in the early part of the manuscript. As you have alluded in the manuscript, having too many players in the team can dilute educational value.

Thank you for noting this point. We have made the following clarification in the 1st paragraph of the methods section:

“We initially designed the game for teams instead of single users to compete in order to use it in group educational activities (e.g. noon conference) and allow the maximum number of residents to actively participate."

We have also added the following to the discussion section:

“Second, the tool can be used by 2 competing single users (instead of teams) or as a tutorial for individual review of CPGs questions.”

2) Coming from a UK background, I find the figure quoted for the use of educational games (78%) high. Was this study done by the authors? - If so, it would be useful to include the relevant question used in the study. ‘Educational games’ is not a clearly defined term and hence different directors may have included activities like quiz sessions.

Thank you for inquiring. Yes, our group conducted two national surveys of directors of residency training programs in Internal Medicine and Family Medicine. The question was worded as follows:

My program already uses educational games:

☐ No ☐ Jeopardy style ☐ Board game ☐ Other: ________________

The response rate was 52%. The percentages of programs using educational games were 78% Internal Medicine and 79% for Family Medicine (manuscript in preparation). Although there is a possibility of response bias (with those using games being more likely to respond), these numbers are not very surprising. For example, educational games have been used for years in residents’ competitions at the annual meetings of national medical organizations. E.g.: http://www.acponline.org/residents_fellows/competitions/doctors_dilemma/
3) By using a quiz type approach to teaching guidelines, this system assumes a certain familiarity with the guidelines. As suggested by one of your respondents from the pilot study, distribution of full guidelines before and/or after the game should be part of the procedure. Not doing so might increase a piece meal uptake of the guideline without a holistic insight into it.

We completely agree that the familiarity of residents with the guidelines is important for the success of this educational intervention. In order to achieve this, we opted to make the guidelines available for pick up by interested residents rather than distributing them to all residents. This follows the first principle of the adult learning theory stating that adults are autonomous and self-directed. We are hypothesizing that residents, as a result of the educational game, will get engaged enough to take charge of their own learning, including picking up the guidelines to read them and get familiar with them for the next game session.

We have clarified the text explaining our approach to this issue is as follows:

“The residents would be made aware of what guidelines are being “played” the following week. Copies of the guidelines would be made available to interested residents, e.g. through the chief medical resident, rather than distributed to all residents. This is following the first principle of the adult learning theory stating that adults are autonomous and self-directed [11]. We are hypothesizing that residents, as a result of the educational game, would get engaged and take charge of their own learning by getting copies of the guidelines, reading them and becoming familiar with them for the next game session.”

4) There are a number of acronyms which are perhaps familiar to an US audience, but international readers of BMC Medical Education may struggle with all the organisations mentioned in ‘Additional File 1).

Thank you for the note. We have spelled out all acronyms.

5) It is not clear from the description if the moderator inputs answers for the teams or if the teams do it themselves. Although seemingly trivial, this information is important for anyone trying to develop similar systems.

A detailed description of the rules is provided in the Additional file 3. We have clarified the following:

“The leading team has x seconds to provide an answer (choice of one from among few answer options).”

We hope this answers the question.
6) Pilot Study: How was feedback obtained (Structured vs freetext or combination). How did you measure acceptability (eg: 5 point scale) and other factors. Please consider including the questionnaire.

As mentioned above, the endpoints we evaluated for feasibility were: the integration in the curriculum, the functionality of the tool, the quality of the questions, and the rules of the game. For evaluating feasibility we conducted pilot testing sessions followed by feedback sessions consisting of answering in writing open ended questions followed by an open verbal group discussion. We describe the pilot testing and feedback as follows:

“We pilot tested the Guide-O-Game© in order to evaluate its feasibility in terms of integration in the curriculum, the functionality of its tool, the structure of its questions, and the usability of its rules. We conducted four weekly sessions of the game at a hospital training site for the Internal Medicine residency program at the University at Buffalo. A senior resident (RM) doing an EBM elective run the sessions [11] and participants consisted of a convenience sample of 30 residents rotating at the training site at that time. Each session lasted 45 minutes and was followed by 15 minutes qualitative feedback sessions. The feedback consisted of answering in writing open ended questions followed by an open verbal group discussion. We improved each of the three components of the game (tool, questions, and rules) through an iterative process of pilot testing, feedback and revision.”

The endpoints we evaluated for acceptability were: interest in the educational strategy and engagement in the learning process. We evaluated acceptability as part of the feedback sessions as follows:

“The 15 minutes qualitative feedback sessions included questions about the acceptability of the game in terms of interest in the educational strategy and engagement in the learning process. We used the results of the evaluation after each session to improve the game prior the following session.”

Although the brief questionnaire was structured around the 5 points mentioned above, the answer options were open ended rather than standardized in order to stimulate discussion. The questionnaire was not validated. We now mention these issues as a limitation of the study design:

“Also because of the qualitative nature of the evaluation, we used a non-standardized non-validated measurement tool”

We now include the questionnaire as Additional file 4.

7) Jeopardy Style: Many of your readers may have played Jeopardy either!

Thank you for making this remark. Initially we opted to refer to Jeopardy thinking it would be widely recognized. Now we refer to TV game shows in general in order to avoid any issues related to intellectual property. In order to make sure it is clear for the reader what Guide-O-Game© is, we describe it in detail in the manuscript, Additional file 3 and the figures.
8) You also mention web-based games as your next stage. Presumably, the teams will be able to play ‘asynchronously’.

The intention is for teams physically apart to compete in real time. We also mention in the text of option of using the game as a tutorial for individual review of CPGs questions.

9) In terms of wider applicability and generalisability, please elaborate on how your solution is better than other relatively easier approaches (like developing a powerpoint slideset with hyperlinks from questions to correct/incorrect answer slides).

Thank you for the suggestion. We have added the following paragraph to the discussion section:

“Other relatively simpler tools, such as Microsoft PowerPoint slide sets with hyperlinks from questions to answer slides, are available on the Internet for adaptation for educational games. The developed interface is superior to those simpler tools for managing the game as it simplifies question creation and editing, allows automated data collection, and produces usage reports. It is also superior for running the game considering the automated scoring, the entertaining sounds, and the imbedded countdown clock.”

10) “Integrating the game in the curriculum is both feasible and acceptable by residents” (First para of discussion). In UK English, we would say ‘acceptable to’ or ‘considered acceptable by’.

Thank you. We have made the correction.

Overall, well-written manuscript which will be of interest to readers of BMC Medical Education. I would recommend for publication once above factors are revised.

We greatly appreciate the constructive input.
Reviewer: Gerard McKay

This paper is interesting. I have some reservations that I would like the authors to address;

Thank you for the positive and constructive feedback.

MAJOR REVISIONS
The paper is a description of how an educational game to teach CPGs in internal medicine was developed and results show what has been achieved in terms of the multimedia interactive tool, the questions developed and the definition of the games rules. The abstract and main results section refer to a qualitative assessment of its acceptibility amongst residents. This section is important if the authors are to draw the conclusions that it is both feasible and acceptable. I think that it would be necessary to improve upon this section of the results. The authors state that there was ‘about 30’ participants. How many was there?

Thank you for the suggestions. The number was 30 so we took out “about”.

How many enjoyed it as compared to other ways of learning? How many got more interested in the clinical guidelines as a result? ..........etc. I do not think that the authors can conclude that the game is acceptable based on this vague pilot results section. It might be best to leave it out altogether and merely conclude that it is feasible and would then have to look at its acceptibility in a further qualitative study.

We have now clarified the section about acceptability of the game in both the methods section (as detailed above) and in the results section as follows:

“Participants found the game to be an acceptable educational strategy. First, the game format made the residents more interested in guidelines recommendations which they described as “a dry material”. The interest increased when we integrated a rationale for each recommendation in the game. Second, they felt playing the game is fun, especially when racing against time to select an answer and when the scores of the two teams get very close. This helped them “relax a bit” during a time of the day when work pressure is high (sessions were run during noon conference time). Third, as a result of the fun and the increased interest, the residents reported being more engaged in the learning process in comparison with usual didactic lecture during which they become “easily distracted”. Fourth, while residents became actively engaged during the session there were some indicators that they might have also become actively engaged after the session. Indeed, one resident asked which CPGs were to be played the following week so she could “review them in advance”.

While participants found most of the questions relevant to their practice, they judged some of them as non-relevant. One example relates to the number of procedures a laboratory need to perform per year to be considered an appropriate percutaneous coronary intervention center. They also criticized not providing a rationale for each recommendation in the initial version of the tool. We did subsequently add such rationale which proved helpful in increasing residents’ interest. The residents finally recommended
having a review period at the end of each session which we used for discussing some of
the answers and rationales.”

Given the qualitative nature of the evaluation, we did not aim to determine the exact number of
participants who enjoyed the game or got more interested in guidelines. We believe that the
results we report are both valid and informative and we hope that the clarifications satisfy the
reviewer. If not, we would be willing to take out this section.

Although the final sentence in the last paragraph of the conclusions suggests the need for a
formal trial to test the effect of the Guide-O-Game there has been nothing in the results to
substantiate the dual claims of the final paragraph ie it can improve knowledge through
exposure... and it can ‘incite’(!) residents to learn because of its competitive nature.

As noted above, we agree with the reviewer that the claims, as worded, are not supported by data
presented in this paper or by other studies. To emphasize this point and avoid misleading readers,
we have added the following statement to the discussion section:

“A recent systematic review did not identify good quality evidence to confirm or refute
the utility of games as a teaching strategy for health professionals [7].”

Our intention was to use a less affirmative tone to suggest how the game, based on theoretical
assumptions, could potentially improve residents’ knowledge. We now use a less affirmative
tone by replacing “can” by “may”.

“The Guide-O-Game© may potentially improve residents’ knowledge of guidelines’
recommendaions ... may incite residents to learn ...”

We prefer not to delete those statements because they allow us to suggest how the game might
work.

Because of the uncertainly on whether and how games work, we conclude the discussion section
with the following statement:

“However, only a trial of high methodological quality can demonstrate the true effect of
the Guide-O-Game© on residents’ knowledge.”

MINOR REVISIONS
1 -Discussion - not particulary well structured but did make a good attempt to highlight the
shortcomings in addition to the strengths of the game. In the first paragraph the authors
suggest that ‘integrating the game in the curriculum is feasible.........’ and refer to
unpublished data about directors of internal medicines views on educational games. Would
be good to have a feel for the strength of this data, particularly given that there are other
means eg online modules with web based assessment to improve individuals knowledge,
that may be more cost effective for example.

These statements are based on data from two national surveys of directors of residency training
programs in Internal Medicine and Family Medicine (manuscript in preparation). The response
rates for the 2 surveys were 51% and 52% respectively. The percentages of program directors who supported the use of educational games were 90% and 94% respectively. The percentages of programs already using educational games were 78% and 79% respectively.

2 - The game has been designed for use in the US. This has to be a shortcoming or at least there has to be reference to the fact that it is but potentially could be adapted for elsewhere.

Thank you for noting this point. We did not design the game for use in the US only. We have modified the statement relating to the adaptation of the Guide-O-Game© as follows:

“Third, the Guide-O-Game© tool can be adapted for teaching in other specialty residency programs, in countries other than the United States and other content than CPGs.”

3 - Paragraph 4 in the discussion - I do not agree with the assertion that recommendations in guidelines are clear cut. The recommendations in guidelines are usually based on varying levels of evidence and as a result some are more clear cut than others.

We agree with the reviewer in as much that the recommendations in many guidelines are not clear-cut despite the fact that the recommended action should be clear-cut. However, we have extensive experience with guideline development and have focused on the formulation of guidelines and, to enhance implementation, their improvement in terms of giving what they are intended to give: a clear advice for action. This is why we chose clear-cut guidelines. We modified the statement to read.

“Indeed, when we initially got interested in exploring the value of educational games in residency training, we focused on guidelines that intended to make clear-cut recommendations and selected strong recommendations based on a clear balance of benefits-downsides.”