Education Research: An exploration of case-based learning in neuroscience grand rounds using the Delphi technique

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ABSTRACT

Background: Neuroscience grand rounds (NSGR) is a key educational exercise in most academic medical centers. Despite its importance, there are few published studies evaluating the manner in which it is conducted. Our objective was to obtain consensus opinion from staff neurologists, neurosurgeons, neuroradiologists, and neuropathologists on the features that best characterize a highly educational NSGR.

Methods: Using the Delphi technique, multiple rounds of questionnaires were presented to a panel of neurologists, neurosurgeons, neuropathologists, and neuroradiologists. The anonymous responses were analyzed and fed back to participants. Each round, the participants were given the opportunity to react to collective opinion by changing their response or by presenting arguments in favor or against the item in question.

Results: We found that support for NSGR in its present form is high and that particularly strong support exists for 1) case-based rounds, 2) high level of audience interaction, 3) resident participation in case presentation and analysis, 4) formal training for residents in leading case-based presentations, and 5) resident feedback and evaluation.

Conclusions: Our results offer centers that use a case-based format for NSGR with guidance to maximize the important learning opportunity that it provides. We provide an organized evaluation of expert opinion on how this important educational exercise should be conducted. The results expose some fresh insights into traditional values in medical education.

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GLOSSARY

MGR = medical grand rounds; **NSGR** = neuroscience grand rounds; **RCPSC** = Royal College of Physicians and Surgeons of Canada.

Modern-day grand rounds come from a rich tradition of case-based learning founded on the teaching practices of Jean Martin Charcot. In 1878, he opened his neurologic case presentations to an audience of physicians, trainees, and interested members of the public. Once a week, patients would be brought into a large auditorium where Dr. Charcot would question and examine them in front of the audience. After the patient was dismissed, he would provide a meticulously prepared and highly engaging multimedia presentation on the disease topic using drawings, charts, anatomic specimens, and a slide projector.¹

Medical grand rounds (MGR) emerged in the late 19th century using a similar format. However, in the last half of the 20th century, there has been a shift in MGRs away from case-based presentations to a more topic-based didactic teaching approach. This trend has been reported in a survey of Canadian internal medicine programs,² 2 large surveys of US teaching hospitals,^{3,4} and noted anecdotally by others.⁵⁻⁸

Grand rounds are a cornerstone of education in most academic medical centers. It is considered at many institutions to be the most important and the most expensive teaching conference.^{9,10} Despite the importance of this educational exercise across disciplines, studies reveal

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that MGRs often lack organization and planning and are not adhering to some key evidence-based educational methods. One study¹¹ evaluated the extent to which effective evidence-based educational methods are being implemented at a US teaching center. The researchers found that MGRs only minimally reflected evidence-based practices and instead consisted of slide-driven, noninteractive presentations covering a variety of subspecialty topics. In a survey of 150 educational program directors in Calgary hospitals, most respondents considered grand rounds the main hospital-based continuing medical education activity in their discipline. However, only 13% of rounds were based on a curricular structure, and 16% were based on needs assessment.¹²

In many Canadian academic medical centers, neurology and neurosurgery services have combined to form a neuroscience grand round (NSGR), the format of which retains many of the traditional features first introduced by Charcot. A resident presents a case followed by audience discussion and a didactic teaching period. The moderator, typically a staff physician, is assigned the role of engaging the audience and ensuring that key points are not left unexplained. The case-based format enables active learning through discussion and audience interaction. Trainees are often asked to problem solve aloud which provides opportunity for feedback and clarification. The rounds facilitate discussion between subspecialists with expertise in the neurosciences so that continuing medical education is fostered.

The objective of this study was to obtain consensus opinion from staff neurologists, neurosurgeons, neuroradiologists, and neuropathologists on the features that best characterize a highly educational NSGR.

METHODS This study was approved by the Capital Health Research Ethics Board.

The Delphi technique. The Delphi technique is a method designed to obtain group opinion and consensus on a specified question. The purpose is to explore the underlying assumptions of a group and to develop a statement or set of statements that represents the viewpoints of participants. The process involves multiple rounds of questionnaires presented to a panel of respondents. The questionnaires are completed anonymously by a se-

lected group of experts on a particular topic and the responses are analyzed and fed back to participants. With each round, the participants are given the opportunity to react to the collective opinion by changing their response or by presenting arguments in favor or against the item in question. The study is completed when consensus is reached or response rate declines.^{13,14}

Selection of the panel. All neurologists, neurosurgeons, neuroradiologists, and neuropathologists at Dalhousie University were invited to participate. All 32 met the following specific inclusion criteria¹⁵:

1. Has a proven track record in professional practice
2. Has considerable experience (more than 2 years) as faculty in a teaching hospital
3. Demonstrates continuing interest in education in the neurosciences
4. Makes an active contribution to education in the neurosciences

An information sheet was emailed to all potential participants with a description of the study and an invitation to participate. Consent was implied through their completion of the questionnaires.

Questionnaire development. The first round questionnaire was developed through the use of a small focus group composed of the principal investigator, a neurologist, and a neurosurgeon. The literature was reviewed by the principal investigator and used as the basis for the focus group discussion and preliminary questionnaire.^{16–18} A list of opinion statements that characterize NSGRs was generated and divided into themes.

In the first round questionnaire, participants were asked to rate their level of agreement with each statement using a 4-point Likert scale with the options strongly disagree, disagree, agree, or strongly agree. A neutral middle point was excluded to compel respondents to choose a particular option.¹³ The participants were invited to comment on the items and present arguments in support of or in opposition to a particular viewpoint. They were also invited to add items for consideration in subsequent rounds.¹⁴ The participants' wording for these new items was maintained with minor editing.¹⁹ The first round questionnaire was piloted by the 3 members of the focus group for ease of use and appropriateness of format.¹⁴ No significant changes were made as a result.

The second and third round questionnaires used the same format except comments generated from the previous round questionnaire were included for each item and opportunity to add new items was no longer available.

The respondents were instructed to evaluate only the resident-led, case-based rounds that account for the majority of NSGRs at our institution.

Data analysis. In the analysis of each round, descriptive statistics were applied to the data. Mean scores were calculated to determine the strength of group opinion on each item and standard deviations were used to measure dispersion of the responses.

Consensus was defined by the proportion of respondents being in agreement for or against a statement. No universally agreed-upon criteria exist for this and variable cutoffs have been used in the literature. Many researchers allow the data to decide the level of consensus rather than making a prespecified determination.^{15,20,21} Others have used cutoffs ranging from 55% to 100%.^{13,15,22–24} In our study, a cutoff of 80% was used to define consensus.^{22,24,25} Positive consensus was defined as 80% or more of respondents indicating agree or strongly agree (score of 3 or 4). Negative consensus was defined as 80% or more of respondents indicating disagree or strongly disagree (score of 2 or 1).

Only those items that did not meet consensus were carried forward into subsequent rounds.^{13,26}

Mean scores on items are a measure of the group support for an item or the strength of opinion held by the group.^{27,28} As with consensus, there are no agreed-upon benchmarks for strength of opinion. Some researchers have highlighted the top 10 scoring statements as their cutoff^{28,29} while others use prespecified mean values.^{13,27} In our study, we chose an arbitrary mean cutoff score of greater than 3.0 or less than 2.0 as the criterion for judging the strength of group opinion for or against an item.

Feedback of results. Statistical summaries were produced for each item to provide participants with information about collective opinion. The summaries were added to the questionnaires in the form of a bar graph for each item indicating in absolute numbers and percentages how participants responded in the round prior. Each individual was also reminded through an individualized e-mail attachment of how they responded in the previous round. This allowed participants to see how their responses compared to the group opinion. Feedback also included the prior round's anonymous comments for each item.

Concluding the study. In the conventional Delphi study, the process is continued until consensus is reached or response rate decline precludes meaningful further analysis.¹⁹ In our study, response rate dropped to 38% in the third round and a decision was made to conclude the study at that point.

RESULTS Thirty-two neurologists, neurosurgeons, neuroradiologists, and neuropathologists at Dalhousie University met the inclusion criteria and were invited to participate. Of the 32 potential participants, there were 20 respondents (63%) in round 1, 16 (50%) in round 2, and 12 (38%) in round 3. Only those participants who responded in the round prior were invited into the next round. The distribution of subspecialties represented in the respondent group approximated that of the invited participants (figure).

The round 1 questionnaire consisted of 56 items (table 1). Consensus (80% or more agreement) was reached on 36 items (64%). Five new items were

added based on comments from the respondents (table 1). The round 2 questionnaire consisted of 25 items (20 items that did not reach consensus in round 1 plus the 5 additional items contributed by respondents). Consensus was reached on 8 items. The round 3 questionnaire consisted of the 17 items from round 2 that did not achieve consensus. Consensus was reached on 5 of those items. In total, there were 61 items considered by the panel and consensus was reached on 49 (80%).

Individual rerating scores on items were used to determine changes in opinion between rounds. This allowed a determination of how the Delphi process impacted group opinion.^{14,26} Of the 11 items that required 2 or 3 rounds to reach consensus, there were 67 out of 153 (44%) answers changed by individual respondents (initial answer compared to answer when consensus was reached). Fifty-four (81%) of those were in the direction of the mean. This suggests that individual opinions were affected by the collective opinion of the group.

To evaluate for the presence of sample bias in later rounds due to attrition, we compared the responses between rounds of participants who completed the consensus round for each item. When the responses of participants in the round in which consensus was reached were compared to the same respondents in the first round, new consensus where none existed in round 1 occurred in only 2 of 11 items. This suggests that the consensus was due primarily to changes in group opinion rather than respondent dropout.

Strength of group opinion for or against an item was judged based on mean scores in round 1. Those items meeting consensus with a mean score of 3.0 or greater or 2.0 or less are highlighted in table 1.

Comments offered by the respondents exposed differing opinions among the experts and highlight the controversial nature of some items. One item that did not reach consensus was stated as follows: Objectives should be presented at the beginning of the presentation. Those in favor commented as follows: "Isn't this required by law?" "This is modern and required of most continuing medical education," "An excellent way of focusing the presentation." Those opposed made the following comments: "Objectives are overrated!" "Stating objectives is a boring exercise for me," "Objectives of all rounds are the same. To learn something. No need to be more specific."

At times, the comments likely played a key role in swaying opinion. One item read: The case should include a complete description of the neurologic examination whether the results are normal or abnormal. In round 1, there was 70% disagreement and this rose to 94% in round 2. Arguments against were

Figure Distribution of subspecialties among respondents

Table 1 Mean and standard deviations of the participants' ratings for the 3 rounds

Item	Round 1		Round 2		Round 3	
	Mean	SD	Mean	SD	Mean	SD
Objectives						
1. An important objective of NSGR is education of residents, medical students, and fellows. ^{a,cf}	3.80	0.41				
2. An important objective of NSGR is education of medical staff. ^{a,cf}	3.80	0.41				
3. An important objective of NSGR is education of the presenting resident. ^{a,cf}	3.75	0.44				
4. An important objective of NSGR is education of other health professionals. ^{a,cf}	3.25	0.64				
5. An important objective of NSGR is acquisition of continuing medical education (CME) points. ^{a,cf}	3.21	0.71				
6. An important objective of NSGR is the evaluation of resident knowledge and skills in clinical problem solving. ^{cf}	2.85	0.81	2.88	0.62	2.91	0.54
7. An important objective of NSGR is career training by giving residents the experience of presenting and addressing questions. ^{a,cf}	3.60	0.50				
Preparation						
1. The resident presenter should review his or her presentation with a medical staff whose expertise is in the chosen topic's field before the presentation. ^{a,cf}	3.30	0.47				
2. Senior residents should be exempt from reviewing their presentation with an expert medical staff in advance of their presentation. ^{ca}	2.16	0.50	2.13	0.34		
3. The resident presenter should review pathology and radiology slides specifically with a pathologist or radiologist before the presentation. ^{a,cf}	3.40	0.50				
4. The resident presenter should inform the staff person involved in the case that his or her case is being presented. ^{a,cf}	3.60	0.50				
Structure						
1. The presentation should always begin with a case presentation.	2.80	0.89	2.75	0.68	2.83	0.58
2. The case and discussion around the case should be the primary emphasis of the round.	2.75	0.79	2.50	0.52	2.67	0.65
3. The topic review should be the primary emphasis of the round.	2.50	0.61	2.56	0.51	2.67	0.49
4. The resident should pause at various stages of the case presentation to allow for discussion and questions. ^{a,cf}	3.37	0.60				
5. At least 25% of the round should be interactive. ^{a,cf}	3.10	0.64				
6. The presenter should be stopped if exceeding the allotted presentation time. ^{a,cf}	3.15	0.75				
Moderator						
1. The role of the moderator is primarily that of an examiner, who assesses the knowledge of the resident presenter and residents in the audience. ^{a,ca}	1.90	0.64				
2. The role of the moderator is primarily that of a facilitator who draws as many audience members as possible into the discussion. ^{a,cf}	3.45	0.51				
3. The moderator should be the time keeper and ensure that appropriate time is given for the discussion and topic review. ^{a,cf}	3.30	0.47				
4. The moderator should be the same individual for every round. ^{ca}	2.05	0.62				
5. There should be more than one individual taking the role of moderator on a rotating schedule. ^{cf}	2.85	0.75	2.63	0.62	2.92	0.51
Case						
1. "Interesting" cases should be selected with the purpose of improving the knowledge and skills of physicians with regard to that particular disease. ^{a,cf}	3.30	0.47				
2. "Problem" cases should be selected with the purpose exploring audience opinions and improving the management of that particular patient through discussion. ^{a,cf}	3.20	0.62				
3. It is valuable to have a patient present at the round.	2.55	0.76	2.69	0.48	2.58	0.51
4. A diagnosis should always be established for the case. ^{ca}	2.10	0.72				
5. The case should include a description of the complete neurologic examination whether the findings are normal or abnormal. ^{ca}	2.15	0.67	2.00	0.37		
6. Priority should be given to rare cases by the resident selecting the topic. ^{a,ca}	2.00	0.73				
7. Priority should be given to common cases by the resident selecting the topic. ^{ca}	2.30	0.66	2.13	0.34		
8. Both rare and common cases should be given equal priority by the resident selecting the topic. ^{a,cf}	3.05	0.60				
9. Radiology slides and pathology images should be read by the presenter. ^{cf}	2.75	0.72	2.88	0.34		
10. Radiology slides and pathology images should be read by a resident in the audience.	2.68	0.48	2.38	0.62	2.42	0.67

— Continued

Table 1 Continued

Item	Round 1		Round 2		Round 3	
	Mean	SD	Mean	SD	Mean	SD
11. Radiology slides should be read by a neuroradiologist in the audience after the resident has made his or her comments. ^{a,cf}	3.05	0.89	2.93	0.70		
12. Pathology images should be read by a pathologist in the audience after the resident has made his or her comments. ^{a,cf}	3.00	0.92	3.06	0.85		
Discussion						
1. Residents from the audience should be specifically selected to answer questions or comment aloud on their impressions of the case. ^{a,cf}	3.30	0.47				
2. Medical students and off-service residents should be specifically selected to answer questions or comment aloud on their impressions of the case. ^{ca}	2.80	0.70	2.69	0.48	2.67	0.49
3. Residents should not be selected for comment unless they volunteer. ^{a,ca}	1.75	0.44				
4. Questions should be directed at faculty members whose subspecialty is relevant to the case under review. ^{a,cf}	3.30	0.57				
5. The staff person involved in the case should always comment during the discussion.	2.80	0.83	2.75	0.77	2.50	0.67
Topic review						
1. The objectives should be presented at the beginning of the presentation.	2.80	0.89	2.69	0.70	2.83	0.58
2. If the diagnosis for the case is rare, the topic review should cover the issues in a comprehensive manner. ^{a,cf}	3.00	0.46				
3. If the diagnosis for the case is common, the topic review should cover a particular aspect of the disease rather than a comprehensive overview. ^{a,cf}	3.10	0.64				
4. In most cases, the topic review should emphasize studies and trials relevant to the topic and outline them in detail. ^{ca}	2.55	0.60	2.31	0.60	2.17	0.39
5. In most cases, the topic review should reference studies and trials without exploring them in detail.	2.60	0.60	2.63	0.50	2.83	0.58
6. The main teaching points should be summarized at the end of the presentation. ^{a,cf}	3.60	0.50				
7. Medical student-level teaching points should be made specifically for medical students in the audience.	2.65	0.75	2.56	0.73	2.50	0.52
8. Teaching points should be made for other health professionals including nurses, physiotherapists, occupational therapists, technicians, scientists, psychologists, etc. ^{ca}	2.50	0.51	2.38	0.50	2.08	0.29
9. Key studies and articles should be referenced on the slides. ^{a,cf}	3.25	0.55				
Presentation						
1. The audiovisuals should include relevant radiographic or pathology images. ^{a,cf}	3.70	0.47				
2. The text on slides should be in point form. ^{cf}	3.60	0.50				
3. The text on slides should be expanded upon by the resident presenter rather than simply read aloud. ^{a,cf}	3.65	0.49				
4. The audiovisuals should include relevant pictures, diagrams, or animations. ^{a,cf}	3.45	0.51				
5. Residents should be given formal training in presentation skills. ^{a,cf}	3.25	0.72				
Evaluation						
1. The presentation should be judged upon criteria for clarity, comprehensiveness, relevance, and appropriate dealing of questions. ^{a,cf}	3.50	0.61				
2. The resident presenter should be evaluated by the audience through written evaluation forms. ^{a,cf}	3.05	0.69				
3. The resident presented should be given verbal feedback by a designated evaluator. ^{a,cf}	3.15	0.59				
New items						
1. Rounds should be used to explore core knowledge as well as new research and clinic care issues. ^{a,cf}			3.00	0.52		
2. Staff members, as well as residents, should take turns presenting at NSGR. ^{cf}			2.44	0.89	2.75	0.87
3. Medical students should be encouraged to present at NSGR.			2.44	0.51	2.33	0.49
4. Residents should meet once a week and together select the best case for presentation at rounds.			2.31	0.70	2.33	0.78
5. Residents should be trained to present at NSGR without any powerpoint slides. ^{a,ca}			2.00	0.37		

Abbreviations: ^{ca} = Consensus against the item; ^{cf} = consensus for the item; NSGR = neuroscience grand rounds.

^a Group opinion strongly for (mean ≥ 3.0) or against (mean ≤ 2.0) the item.

summarized by one respondent as follows: “For the sake of brevity, I think the description should focus on pertinent positive and negative findings. However, the presenter should be prepared to comment further on the complete examination at the request of the audience.” One respondent specifically commented that “I changed my opinion after reading the above comments.”

DISCUSSION This study illustrates the utility of the Delphi method in determining and synthesizing expert opinion about educational activities. The result is a set of consensus statements that reflect the combined views of experienced clinicians and educators. We found that particularly strong support exists for 1) case-based rounds, 2) high level of audience interaction, 3) resident participation in case presentation and analysis, 4) formal training for residents in leading case-based presentations, and 5) resident feedback and evaluation.

Case-based learning. Most respondents agreed that 1) interesting cases should be selected with the purpose of improving the knowledge and skills of physicians with regard to that particular disease and 2) problem cases should be selected with the purpose of exploring audience opinions and improving the management of that particular patient through discussion. There was no consensus about whether the case and discussion or the topic review should be the primary emphasis of the round. Many respondents felt that both of these components are important and serve complementary purposes. Similarly, the panel did not reach consensus over whether the presentation should always begin with a case. However, many respondents explained that their disagreement was based on the word “always” and that, though there may be exceptions, cases are preferred.

Our results highlight a paradox in medical education between how educators believe grand rounds should be conducted and the trends that are actually occurring. We found that, despite the reported trend away from case-based learning in MGRs, this form of learning is highly valued among faculty in the neurosciences.

One component of some case-based rounds is live patient demonstrations. In our study, no consensus was reached on the following item: It is valuable to have a patient present at the round. The original neurology grand rounds started by Jean-Martin Charcot featured patients as a key element of the clinical demonstrations. However, this practice was met with some antagonism. One particularly vocal opponent attacked Charcot’s demonstrations as “a sort of human vivisection on women on the pretext of studying a disease about which he knows neither the cause nor the treatment.” Charcot

countered that “patients consented to clinical demonstrations because they realized that such scrutiny improved their care and treatment as well as benefitting science.”²¹ In our study, those in favor made comments such as, “This can be wonderful, especially if there are particularly unusual findings, or a particular examination technique is to be demonstrated.” However, like the opponents of Charcot, some felt that “this usually becomes a bit of a circus, and is uncomfortable for all concerned.”

Patient appearance has become a far less common practice in modern NSGRs. In a survey of neurology departments in the United States, patients never attend rounds in 44% of programs.³⁰ However, one study found that when patients are invited to attend, most of them consider it a positive experience.³¹

Interactive learning. In this study, a high level of audience interaction was identified as a highly valued component of the rounds. Respondents agreed that 1) at least 25% of the round should be interactive, 2) the role of the moderator is primarily that of a facilitator who draws as many audience members as possible into the discussion, 3) the resident should pause at various stages of the case presentation to allow for discussion and questions, 4) residents from the audience should be specifically selected to answer questions or comment aloud on their impressions of the case, and 5) questions should be directed at faculty members whose subspecialty is relevant to the case under review.

The Royal College of Physicians and Surgeons of Canada (RCPSC) has developed definitions for programs that are certified as professional development group activities. Rounds, which fall under the definition of a group learning activity, must have at least 25% of the time allocated to interactive learning. By making this requirement, the RCPSC has underscored the importance of participants in rounds becoming active learners, not just passive listeners. They have also helped ensure that important competencies, such as communicator and collaborator, are encouraged alongside that of becoming a medical expert.¹⁸

The value of interactive learning has been noted in the setting of a general surgery morbidity and mortality rounds. The study found that perceived educational value was increased with more questioning of audience members and explanations by attending staff.¹⁷

Residents as teachers. Respondents identified residents as key players in the collaborative learning that takes place in NSGRs. Most staff members on the panel agreed that 1) an important objective of the round is career training by giving residents the experience of presenting and addressing questions, 2) residents should be given formal training in presentation skills, 3) the main teaching points

should be summarized at the end of the presentation, 4) the audiovisuals should include relevant radiographic or pathology images, 5) the text on slides should be in point form, 6) the text on slides should be expanded upon by the resident presenter rather than simply read aloud, and 7) the audiovisuals should include relevant pictures, diagrams, or animations.

The amount of teaching done by residents is substantial. One study found that residents spend up to 25% of their time teaching.³² In a 2011 survey of Canadian specialty programs, all responding programs (n = 78) incorporated some kind of mandatory teaching responsibilities for residents.³³ However, many residents are given little, if any, formal instruction on how to teach effectively.^{34,35}

Grand rounds are a unique venue for resident teaching. The skills required to prepare effective audiovisual presentations and deliver the material clearly and confidently are valuable competences used throughout a medical professional's career.³⁶

Resident evaluation and feedback. We found that there is strong support among staff for resident feedback and evaluation following a grand rounds presentation. Respondents agreed that the presentation should be judged upon criteria for clarity, comprehensiveness, relevance, and appropriate response to questions. Staff members support the use of written evaluation forms. However, they also feel that resident presenters should be given verbal feedback by a designated evaluator.

Feedback, in contrast to evaluation, is intended to inform rather than judge. By being specific and based on observed behavior, feedback enables mistakes to be corrected and good performance to be reinforced.³⁷ A designated evaluator allows feedback to be immediate, private, based on specific information rather than generalizations, and constructive.

Strengths and limitations. Strengths of this study include its anonymous format, controlled feedback, and the statistical analysis of group response. Individuals were given the opportunity for anonymous freedom of expression in a written forum that encourages an open display of opinion. Through controlled feedback, they had the opportunity to consider other viewpoints and change their opinion. The analysis provides a statistical measure of both consensus and strength of opinion. It gives equal weight to each individual's opinion and minimizes individual dominance.

There are also limitations to this study. First, it was conducted at a single institution and more research may be needed before results can be generalized to other centers. Second, there is no universal or statistically validated definition of consensus for use

Table 2 Practical recommendations for a successful neuroscience grand rounds

Encourage presenters to use a clinical case to focus discussion and introduce a topic
Provide opportunity for questions and analysis from audience members
Encourage residents to lead the presentations and to participate in the discussions
Provide residents with formal training in delivering case-based presentations
Provide residents with timely, specific, and constructive feedback

in the Delphi process. The definition selected for this study was believed to balance the importance of majority agreement with the risk of abandoning meaningful findings. The results should be interpreted according to the study definition where consensus does not represent unanimity of opinion. Finally, there was a risk of introducing sample bias in later rounds of our study through respondent attrition. However, as detailed in the Results, analysis of the respondent pattern suggests that consensus was due primarily to changes in group opinion rather than respondent dropout.

Overall, a group of experienced clinician educators strongly supported case-based rounds as an effective learning tool. The case-based format places knowledge in a meaningful context and provides a realistic and relevant catalyst for discussion and interactive learning. Residents are provided with frequent opportunity to develop teaching skills in a setting where professionals at all levels of learning can benefit. Practical suggestions for a successful NSGR based on our results are provided in table 2. However, our study also exposes some areas for improvement in domains that may be less widely addressed. There is support among faculty members for providing residents formal training in presentation skills. Many also feel that staff-led rounds would be a useful way of enhancing the educational value of the conference and would provide residents with a model for how to present effectively. Finally, novel methods for resident evaluation and feedback can be developed and designated staff evaluators assigned.

While the structure and format of grand rounds has been shifting since its origin more than a century ago, studies looking at how physicians view grand rounds have been sparse. Our study provides an organized evaluation of expert opinion on how this important educational exercise should be conducted. The results of this study expose some fresh insights into traditional values in medical education.

Our study provides a list of features and practices believed by experts to contribute to the effectiveness of grand rounds at a single institution. Future studies

should be done in other centers to help validate these results. As our understanding of the evidence-based practices that characterize effective grand rounds increases, changes need to be implemented to reflect that understanding and revisions rigorously evaluated to determine their impact.

AUTHOR CONTRIBUTIONS

All authors made a substantive intellectual contribution to the submitted manuscript including the design of the study, interpretation of the data, and drafting or revising of the manuscript.

DISCLOSURE

The authors report no disclosures relevant to the manuscript. **Go to Neurology.org for full disclosures.**

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