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Message from the Editor-in-Chief

We Must Improve How Clinicians Interpret the Study Results of Benefit and Harm

Knowledge translation (KT) has become a pivotal part of the research world.¹ For research to have meaning, the results must be communicated to others who can appreciate and use the new information in some relevant capacity. From the clinician’s perspective, KT is an essential ingredient to closing the gap between best evidence and clinical practice.² How the presenters at a medical conference communicate the results of clinical studies to practising physicians is the subject of an article by Allen et al in the current issue of the Canadian Journal of General Internal Medicine (CJGIM). The authors point out that the terminology and format by which results are communicated may be less than ideal. What is also striking is the limited ability amongst clinicians for understanding the formats commonly used for communicating study results. It is this latter issue that clearly needs to be addressed in medical schools and residency programs. Moreover, the ideal solution to improving the communication of statistical information to practitioners, so that they can make fully informed therapeutic decisions, is not to narrow the format to a select number of “ideal” parameters, but rather to expand the ability of the recipients to understand as many of these relevant terms as possible.

For almost a quarter of a century we have heard about the need to present data in absolute rather than relative numbers.³ But it would be a mistake to believe that the solution to the problem of clinicians (or patients) over estimating the magnitude of the benefit of a therapeutic intervention is to switch from relative terms to absolute terms. While NNT (number needed to treat) does simplify the matter of therapeutic benefit (or harm), the NNT results would only apply to a population of patients with the same incidence of disease as has occurred in the study where the data are derived. While the latter may be the most common situation, it is certainly not the only scenario where clinicians are making therapeutic decisions. Clearly we should want clinicians to be able to manage other circumstances and that is why they need to know how to use both the RRR (relative risk reduction) and the NNT. Further, not all data can be presented as RRR or NNT. Continuous data that cannot (or should not) be dichotomized may need to be presented as means or alternative parameters.

Therefore, if action needs to be taken in response to articles like Allen et al, a greater emphasis needs to be placed on teaching both medical students and physicians in residency programs to understand how to interpret the full menu of parameters and terms that they will encounter either in the medical literature or at conference/rounds presentations. To be successful, lifelong learners/physicians will need to enhance their skills for data interpretation, in addition to the activity of seeking out updated information.


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Mitch Levine
Il faut améliorer la façon dont les cliniciens interprétent les résultats de recherche en ce qui a trait aux effets bénéfiques et aux effets nocifs

L’application des connaissances (AC) joue un rôle essentiel dans le monde de la recherche. Pour qu’une recherche soit significative, les résultats doivent être communiqués aux personnes qui peuvent apprécier l’information nouvelle et l’utiliser de façon pertinente. Du point de vue du clinicien, l’AC est un élément indispensable pour combler l’écart entre le monde des meilleures données probantes et celui de la pratique clinique. Dans le présent numéro de la Revue canadienne de médecine interne générale (RCMIG), la façon dont les conférenciers présentent les résultats d’essais cliniques à des médecins praticiens au cours d’un congrès médical fait l’objet d’un article d’Allen et coll. Les auteurs soulignent que la terminologie utilisée pour communiquer les résultats ainsi que la présentation de ceux-ci sont parfois loin d’être idéales. Ce qui frappe également, c’est la capacité limitée de bien des médecins de comprendre la structure de présentation des résultats couramment utilisée pour la communication de résultats de recherche. C’est ce dernier point qui se doit d’être nettement amélioré dans les facultés de médecine et les programmes de résidences. En outre, la solution idéale pour améliorer la communication de renseignements statistiques aux praticiens, pour que ces derniers soient en mesure de prendre des décisions thérapeutiques pleinement éclairées, ne consiste pas à restreindre les structures de présentation à un nombre limité de paramètres « idéaux », mais plutôt à développer la capacité des apprenants à comprendre le plus grand nombre possible de ces termes spécialisés.

Cela fait presque un quart de siècle que nous parlons du besoin de présenter les résultats en chiffres absolus plutôt qu’en valeurs relatives. Toutefois, ce serait une erreur de croire que la solution au problème des cliniciens (ou des patients) quant à l’évaluation des bénéfices d’un traitement consiste tout simplement à passer des valeurs relatives aux chiffres absolus. En effet, même si le nombre de sujets à traiter (NST) simplifie la question d’évaluation des bénéfices (ou des préjudices), les résultats basés sur un NST ne pourraient s’appliquer qu’à une population de patients ayant la même incidence de la maladie que celle de l’étude dont les données déduisent. Même si cette dernière situation peut s’avérer être très fréquente, elle n’est certainement pas la seule où les cliniciens doivent prendre des décisions thérapeutiques. En clair, nous devrions vouloir que les cliniciens soient en mesure de faire face à d’autres situations et c’est pourquoi ils ont besoin de savoir utiliser autant le risque relatif (RRR) que le NST. Par ailleurs, toutes les données ne peuvent être présentées à l’aide du RRR ou du NST. Les données continues qui ne peuvent (ou ne doivent) être classifiées par dichotomie peuvent devoir être présentées sous forme de moyennes ou de paramètres autres.

(Suite à la page 37)
Inadequate Presentation of Evidence in an Internal Medicine Conference

Michael Allen MD, MSc, Brian D. O’Brien MD, MSc, C. David Simpson MD, FRCPC, FACP, Katie Lightfoot MA, MD Candidate, Tanya MacLeod MSc

Abstract

Background

Studies have found that physicians are more likely to consider therapy effective when information is presented in relative terms (e.g., RRR, OR, HR) rather than in absolute terms (ARR, NNT). In an earlier study of family physician (FP) therapeutics conferences, we found that speakers presented data more frequently in relative than absolute terms, but most frequently in general terms such as frequencies, percentages, graphs, and P-values with no data.

Objectives

To study a national internal medicine conference and determine 1) how completely research data supporting therapeutic recommendations is reported in relative and absolute terms; and 2) how well learners and speakers understand relative and absolute terms.

Methods

We videotaped and analyzed 14 presentations from the 2011 Canadian Society of Internal Medicine Annual Scientific Meeting. Learners and teachers at the meeting completed an online statistical comprehension survey.

Results

Of 549 slides we analyzed, 148 made therapeutic recommendations and 145 presented research data. Of those 145 slides, 81% presented data in general terms, 31% in relative terms, and 3% in absolute terms. For RRR, ARR, NNT and CI, approximately 40% of learners and 50% to 70% of speakers considered they understood these terms well enough to explain them to others. Approximately 35% of learners and 43% of speakers answered questions about RRR, ARR, NNT, OR and HR correctly.

Conclusions

Learners who attended this conference were not provided with the statistical information they needed to make fully informed therapeutic decisions. There was inadequate knowledge of basic statistical terms among both learners and teachers.
Résumé
Contexte
D’après les études, les médecins sont plus enclins à considérer un traitement comme efficace lorsque l’information s’y rattachant est présentée en valeurs relatives (p. ex. : RRR, RRE, RH) plutôt qu’en chiffres absolus (RRA, NST). Dans une étude sur les conférences portant sur les thérapeutiques et s’adressant aux médecins de famille, nous avons constaté que les conférenciers présentent l’ensemble des données plus fréquemment en valeurs relatives qu’en chiffres absolus, quoique plus souvent en termes généraux tels : fréquences, pourcentages, graphiques, valeurs p, et ce, en l’absence des données collectées.

Objectifs
Étudier une conférence nationale de médecine interne et déterminer : 1) dans quelle mesure les données de recherche appuyant les recommandations relatives aux traitements et présentées en valeurs relatives et en chiffres absolus sont-elles complètes; et 2) dans quelle mesure les participants et les conférenciers comprennent-ils les notions de valeurs relatives et de chiffres absolus.

Méthode

Résultats
Sur les 549 diapositives que nous avons analysées, 148 comportaient des recommandations thérapeutiques et 145 présentaient des données de recherche. De ces 145 diapos, 81 % présentaient les données en termes généraux, 31 % en valeurs relatives et 3 % en chiffres absolus. En ce qui a trait aux notions de RRR, RRA, NST et de LC, environ 40 % des apprenants et de 50 à 70 % des conférenciers considéraient comprendre suffisamment bien ces notions pour pouvoir les expliquer. Or, environ 35 % des apprenants et 43 % des conférenciers ont répondu correctement aux questions portant sur les notions de RRR, RRA, NST, RRE et RH.

Conclusions
D’une part, les apprenants qui ont participé à cette conférence n’ont pas reçu l’information statistique nécessaire pour être en mesure de prendre des décisions éclairées en matière de thérapeutiques. D’autre part, il s’avère que les enseignants, tout comme les apprenants, comprennent mal les données de base en matière de statistique.

Abbreviations
AR – Absolute risk
ARR, ARI – absolute risk reduction, increase
CI – confidence interval
CME – continuing medical education
FP – family physician
HR – hazard ratio
NNT, NNH – number needed to treat, harm
OR – odds ratio
RR – relative risk
RRR, RRI – relative risk reduction, increase
Introduction

Large conferences are a major source of CME for specialist physicians. It is important that information presented in them be evidence-based and present data completely since studies have found that physicians are more likely to consider therapy effective when information is presented in relative terms (e.g., RRR, OR, HR) rather than in absolute terms (ARR, NNT). Forrow et al found that 97 out of 235 U.S. physicians (41%) indicated a stronger inclination to treat patients after receiving data presented as the relative change in outcome rate (p<0.001). 1 Naylor found that Canadian specialists were least likely to rate treatments as effective when data were presented as NNT, and most likely to rate treatments as effective when data were presented as RRR.2

A question that arises is which, if any, format is correct for presenting data. The authors of these papers and the National Institutes of Health3 suggest that no one measure provides the information necessary for physicians to make an informed decision about the results of clinical trials. They suggest that data be presented in absolute and relative terms. Specialists’ understanding of absolute and relative terms appears to be less than optimal. Studies assessing specialists’ understanding of these terms have found that 45%-82% understand ARR, 50%-71% RR, and 30%-57% OR.4,5,6,7 In a study of Canadian specialists, 35%, 25% and 12.5% correctly defined ARR, RRR and OR respectively.6

In an earlier study of FP therapeutics conferences, we found that speakers presented data more frequently in relative than absolute terms, but most frequently in general terms such as frequencies, percentages, graphs, and P-values with no data. Of the 1367 PowerPoint slides we analyzed, 225 presented data in general terms, 50 in relative terms and 19 in absolute terms.6 In this paper, we report the results of a repeat of this study with internal medicine specialists. Our research questions were: 1) how completely is research data supporting therapeutic recommendations reported in relative and absolute terms and 2) how well do learners and speakers understand relative and absolute terms?

Methods

We studied internal medicine specialist speakers and learners at the Canadian Society of Internal Medicine Annual Scientific Meeting held in 2011 (hereafter referred to as CSIM Meeting). The Ethics Review Board of Dalhousie University approved the study.

Question 1: How is Research Data Presented?

We sent all 68 speakers a letter informing them that we would be videotaping their CSIM presentation for a research study. The letter explained that we would disclose the purpose of the study after the conference because we wished speakers to present as they normally do. Five speakers indicated that they did not want their presentation to be videotaped. After the conference, we informed speakers about the purpose of the study and invited 29 speakers with eligible presentations that included therapeutic recommendations to participate. We received consent from 17 out of 29 speakers (59%).

Our final sample included 14 presentations as we removed three presentations from the analysis because of their lack of emphasis on therapies. The rating tool was created in Microsoft Excel and automatically summed the slides in each category and was used in a previous study involving family physician conferences.8 The rating tool is available from the lead author.

For each presentation, 2 researchers (MA, BO) independently analyzed the digital recording and counted slides that presented data in relative terms (OR, HR, RR, RRR, RRI), absolute terms (ARR, ARI, NNT, NNH) or general terms (frequencies, percentages, graphs, only P-values, prevalence, events per 1000 person-years).

Slides presenting quantitative data but not providing a reference were not counted as research data. Slides not directly relevant to the presentation were excluded (title slides, cartoons, and irrelevant graphics). If the digital recordings were of inadequate quality to rate slides, we reviewed PowerPoint files, which provided full details of the content. The 2 researchers then reviewed all slides together and to resolve any discrepancies in rating through discussion. The final decision on these discrepancies was made through discussion with a third author (DS). Finally, the same 3 authors reviewed presentations to determine which could be improved through more complete presentation of research data.

Question 2: How Well Do Learners and Speakers Understand Relative and Absolute Terms?

We developed a questionnaire using items from McColl et al9 to assess speaker and learner understanding of research terms (See Appendix). The questionnaire was available online throughout the conference and for two weeks afterwards. Conference moderators made repeated requests throughout the meeting to encourage learners and speakers to complete the questionnaire. After the conference, we sent an email to learners and speakers reminding them to complete the questionnaire. We compared questionnaire responses of learners and speakers with Chi-square using Fisher’s exact test since some cells contained fewer than 5 responses. Questionnaire data was analyzed using SPSS v 18.
Results

Question 1: How is Research Data Presented?
We analyzed 549 slides from 14 presentations. Of those slides, 148 made therapeutic recommendations and 145 presented research data. Of these 145 slides, 117 (81%) presented data in general terms, 45 (31%) in relative terms, and 4 (3%) in absolute terms. Two of the 4 slides presenting absolute terms were in 1 presentation and showed NNT. Fifty-two (36%) slides presented 95% CIs.

We deemed that 21 slides in 9 presentations could have presented data more completely which would have aided understanding of the magnitude of treatment effect. Of these 21 slides that could have been improved, in 16, the improvement was the addition of NNT or NNH. Four presentations did not have specific slides that could be improved by the addition of absolute terms; however, these presentations could have been improved by the addition of more research data (Table 1).

Question 2: How Well Do Learners and Speakers Understand Relative and Absolute Terms?
We received questionnaire responses from 94 learners (response rate 29%) and 34 speakers (response rate 50%). Seventy (74%) of the learners were IM specialists and 22 (23%) were residents. All but 4 speakers were internal medicine specialists. Approximately 50% of speakers and learners were male and the mean time in practice of both groups was 13.4 years. Twenty-three learners and 7 speakers left the survey at the question asking them to calculate statistical terms.

Table 2 shows results of questions asking speakers and learners to rate their understanding of statistical terms. For RRR, ARR, NNT and CI, approximately 40% of learners and 50% to 70% of speakers considered they understood these terms well enough to explain to others. For OR and HR, approximately 15% of learners and 25% of speakers considered they understood these terms well enough to explain to others. Approximately 35% of learners and 43% of speakers answered questions about RRR, ARR, NNT, OR and HR correctly (Table 3). Regarding the amount of emphasis that should be placed on presenting research results when making therapeutic recommendations, 66% of learners and 59% of speakers rated this as 4 or 5 on 5-point Likert scale (data not shown.)

Discussion
We found that, in this CSIM meeting, speakers were much more likely to present research data in general terms than in relative terms. Very little data were presented in absolute terms; only 4 out of 145 (3%) slides that presented research data presented ARR/ARI or NNT/NNH. Confidence intervals were frequently shown on slides but not emphasized in the live presentations. Compared to our previous study of FP CME programs, in the current study a greater percentage of slides presenting research data presented that data in relative terms (31% vs 19%) and with 95% CIs (36% vs 9%). However, the FP programs presented more slides with absolute terms than the IM program (3% vs 7%). There were similar percentages of data presented in relative terms (81% vs 84%). We know of no other study with which to compare our results.

Learners rated their understanding of RRR, ARR, NNT and HR lower than speakers but there was no statistically significant difference between learner and speaker ability to calculate or answer a question about these terms. Approximately one-third of learners and one-half of speakers correctly answered questions about the statistical terms. Both learners and speakers rated their understanding of HR the lowest of any of the statistics we asked about. This is concerning since many results are presented as HRs. In a study of gastroenterologists, Buscaglia et al also found that HR was the least understood term. Poolman et al found that Dutch orthopedic surgeons rated their knowledge of OR the lowest of the statistics but did not ask about HR. Danish specialists rated their knowledge of ARR lower than OR.

A strength of our study is that we used a rigorous approach to evaluate the speakers’ presentations. The tool we have developed for rating slides was used in a previous study and all presentations were reviewed independently by two researchers with expertise in evidence-based medicine. Also, we did not rely only on PowerPoint files to rate the slides presented but also reviewed video recordings of the live presentations. We found that speakers did not mention measures of treatment effect unless they were presented on the slides. However, we did find that speakers omitted some slides that were in their PowerPoint file and we did not include those slides in our ratings. A weakness of the study is that we reviewed a limited number of presentations from a single scientific conference so it may not be possible to generalize to other conferences and specialties. In addition, we did not address other aspects of critical appraisal such as internal and external validity which must be considered when evaluating research results since this was beyond the scope of our study.

Our findings indicate an inadequate knowledge of basic statistical terms among both learners and teachers at the CSIM meeting. This knowledge is necessary for clinicians to make rational decisions about therapy. Also, patients are becoming more active in their decision-making and physicians are encouraged to engage their patients in shared decision-making. Statistical literacy is essential for clinicians and their
Inadequate Presentation of Evidence in an Internal Medicine Conference

Patients to make informed decisions about treatment risks and data should be presented and discussed using relative and absolute terms.\textsuperscript{12,13} A recent Cochrane review reported both health professionals and consumers perceived interventions to be more effective when expressed as RRR compared to ARR and NNT with the suggestion that the formal training of professionals has no effect on their interpretation of statistics.\textsuperscript{14} Physicians who lack proficiency in clinical interpretation of absolute and relative measures should undertake professional development to gain this proficiency, and use it in their clinical decision-making to maintain their expertise.

Several studies have shown that physicians are more likely to prescribe therapies or consider them effective when results are presented in relative terms rather than absolute terms.\textsuperscript{1,2,13,14} Organizers of, and attendees at, educational events should insist that presenters provide absolute as well as relative data. Presenters who teach in educational events, whether for FPs or their internal medicine colleagues, should ensure their presentations include these data. To facilitate these changes, journals should require that authors provide absolute as well as relative measures of treatment effect.

We realize that creating PowerPoint slides showing these measures is time-consuming and have developed an online tool that creates such slides at http://bit.ly/Katie_Calc_Login. A sample slide created by the tool is in the Figure. We have shared our findings with the Canadian Society of Internal Medicine which has offered to repeat the study at future meetings as a quality improvement measure.

**Figure:** Sample slide produced by online tool at http://bit.ly/Katie_Calc_Login

### Dabigatran vs Warfarin in Patients with Atrial Fibrillation – Results

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Event rate</th>
<th>RRR</th>
<th>ARR</th>
<th>Time (yrs)</th>
<th>NNT 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Warfarin</td>
<td>Dabi 150 mg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stroke embolism</td>
<td>3.3%</td>
<td>2.2%</td>
<td>33.3%</td>
<td>1.1%</td>
<td>91 (95% CI 59 – 194)</td>
</tr>
</tbody>
</table>

For this outcome the intervention shows benefit. (ARR = absolute risk reduction, RRI = relative risk reduction, NNT = number needed to treat)

### References

Table 1. Numbers of slides making therapeutic recommendations and presenting research data in general, relative, and absolute terms, and with 95% confidence intervals and which could be improved by the addition of more complete data.

<table>
<thead>
<tr>
<th>Number slides rated</th>
<th>Made therapeutic recommendations</th>
<th>Presented research data</th>
<th>General terms*</th>
<th>Relative terms#</th>
<th>Absolute terms+</th>
<th>95% CI</th>
<th>Could be improved</th>
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<td>17</td>
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<td>10</td>
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<tr>
<td>82</td>
<td>18</td>
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<td>17</td>
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<td></td>
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<tr>
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<td></td>
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<td>45</td>
<td>4</td>
<td>52</td>
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</tbody>
</table>

* general terms = frequencies, percentages, graphs, only P-values, prevalence, events per 1000 person-years
# relative terms = OR, HR, RR, RRR, RRI
+ absolute terms = ARR, ARI, NNT, NNH

Topics presented in Table 1 (presented separately to maintain anonymity of speakers):
- Biologic Agents for Rheumatic Disease
- ACS Cases and Pearls
- Top 5 GIM-relevant Papers in the Past Year
- Osteoporosis
- Management of Hyperglycemia in Hospitalized Patients
- Drugs in Pregnancy and Lactation
- Hypothyroidism
- CCS Antiplatelet Guidelines
- Palliative Care in Heart Failure
- Controversies in Venous Thromboembolism
- CCS Workshop Heart Failure Update
- Hot Topics in Drug Safety
- Summary of ACS Recommendations
- Heart Failure 101
Table 2. Percent of learners (n=94) and speakers (n=34) responses to perceived understanding of measures of treatment effect

<table>
<thead>
<tr>
<th>Measures</th>
<th>Understand and could explain to others</th>
<th>Some understanding</th>
<th>Don’t understand but would like to</th>
<th>Don’t understand and it would not be helpful</th>
<th>No response</th>
<th>P*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RRR</strong></td>
<td>Learner 36%</td>
<td>26%</td>
<td>8%</td>
<td>1%</td>
<td>29%</td>
<td>0.025</td>
</tr>
<tr>
<td></td>
<td>Speaker 59%</td>
<td>18%</td>
<td>0%</td>
<td>0%</td>
<td>23%</td>
<td></td>
</tr>
<tr>
<td><strong>ARR</strong></td>
<td>Learner 39%</td>
<td>26%</td>
<td>4%</td>
<td>1%</td>
<td>30%</td>
<td>0.005</td>
</tr>
<tr>
<td></td>
<td>Speaker 68%</td>
<td>9%</td>
<td>0%</td>
<td>0%</td>
<td>23%</td>
<td></td>
</tr>
<tr>
<td><strong>NNT</strong></td>
<td>Learner 45%</td>
<td>23%</td>
<td>1%</td>
<td>0%</td>
<td>31%</td>
<td>0.018</td>
</tr>
<tr>
<td></td>
<td>Speaker 66%</td>
<td>7%</td>
<td>2%</td>
<td>0%</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td><strong>OR</strong></td>
<td>Learner 19%</td>
<td>31%</td>
<td>20%</td>
<td>1%</td>
<td>29%</td>
<td>0.092</td>
</tr>
<tr>
<td></td>
<td>Speaker 25%</td>
<td>46%</td>
<td>7%</td>
<td>0%</td>
<td>23%</td>
<td></td>
</tr>
<tr>
<td><strong>HR</strong></td>
<td>Learner 13%</td>
<td>33%</td>
<td>24%</td>
<td>1%</td>
<td>29%</td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td>Speaker 21%</td>
<td>52%</td>
<td>5%</td>
<td>0%</td>
<td>23%</td>
<td></td>
</tr>
<tr>
<td><strong>CI</strong></td>
<td>Learner 39%</td>
<td>23%</td>
<td>7%</td>
<td>2%</td>
<td>29%</td>
<td>0.443</td>
</tr>
<tr>
<td></td>
<td>Speaker 52%</td>
<td>23%</td>
<td>2%</td>
<td>0%</td>
<td>23%</td>
<td></td>
</tr>
</tbody>
</table>

RRR, relative risk reduction; ARR, absolute risk reduction; NNT, number needed to treat; OR, odds ratio; HR, hazard ratio; CI, confidence interval; *p-value for differences between learner and speaker responses conducted using Chi-square, Fisher’s exact test.

Table 3. Percent of learners (n=94) and speakers (n=34) correct responses about measures of treatment effect

<table>
<thead>
<tr>
<th>Measures</th>
<th>Answered correctly</th>
<th>No response</th>
<th>P*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RRR</strong></td>
<td>Learner 34%</td>
<td>40%</td>
<td>0.103</td>
</tr>
<tr>
<td></td>
<td>Speaker 39%</td>
<td>52%</td>
<td></td>
</tr>
<tr>
<td><strong>ARR</strong></td>
<td>Learner 38%</td>
<td>44%</td>
<td>0.509</td>
</tr>
<tr>
<td></td>
<td>Speaker 46%</td>
<td>46%</td>
<td></td>
</tr>
<tr>
<td><strong>NNT</strong></td>
<td>Learner 36%</td>
<td>44%</td>
<td>0.419</td>
</tr>
<tr>
<td></td>
<td>Speaker 41%</td>
<td>48%</td>
<td></td>
</tr>
<tr>
<td><strong>OR and HR are both relative measures</strong></td>
<td>Learner 32%</td>
<td>27%</td>
<td>0.115</td>
</tr>
<tr>
<td></td>
<td>Speaker 46%</td>
<td>23%</td>
<td></td>
</tr>
</tbody>
</table>

RRR, relative risk reduction; ARR, absolute risk reduction; NNT, number needed to treat; OR, odds ratio; HR, hazard ratio; CI, confidence interval. *p-value for differences between learner and speaker responses conducted using Chi-square, Fisher’s exact test. Respondents were asked to calculate RRR, ARR and NNT based on a hypothetical study where event rate in the active group and placebo group was 8% and 6% respectively. They were also asked if OR and HR are both relative measures of treatment effect (True/False).
Appendix Statistical Comprehension Questionnaire

**EVIDENCE-BASED MEDICINE QUESTIONNAIRE**

Please indicate: [ ] Male [ ] Female  
Years in practice? (approx.) ______ yrs.  
Your profession: Internal Medicine Specialist [ ] Yes [ ] No  
Other specialist (please specify): ___________________________  
Other (please specify): ___________________________

**INSTRUCTIONS:** The information required to calculate questions 1-3 is provided below. **Please do not guess.**  
If you are not sure, indicate “I don’t know”.

A randomized control trial examined the effect of a drug for lowering LDL cholesterol in patients with coronary heart disease. The outcome was myocardial infarction.

- 1000 patients received the **drug**. 60 (6%) had an MI.  
- 1000 patients received **placebo**. 80 (8%) had an MI.

1. **What is the number needed to treat (NNT) to prevent 1 myocardial infarction?**  
   ______ patients  
   [ ] I don’t know

2. **What is the absolute risk reduction (ARR) for myocardial infarction?**  
   ______%  
   [ ] I don’t know

3. **What is the relative risk reduction (RRR) for myocardial infarction?**  
   ______%  
   [ ] I don’t know

4. **The odds ratio and hazard ratio are both relative measures of the effect of a therapy.**  
   [ ] True  [ ] False  [ ] I don’t know

**RATE YOUR FAMILIARITY with research terms (a) – (f) in the table below:**

<table>
<thead>
<tr>
<th></th>
<th>Understand and could explain to others</th>
<th>Some understanding</th>
<th>Don’t understand but would like to</th>
<th>Don’t understand and it would not be helpful for me to understand</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Relative risk reduction</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>b. Odds ratio</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>c. Hazard ratio</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>d. Absolute risk reduction</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>e. Number needed to treat</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>f. Confidence intervals</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
</tbody>
</table>

Have you completed an evidence-based medicine course/workshop in the last 10 years?  
[ ] Yes  [ ] No  
If yes, please indicate where: (check all that apply) [ ] Undergraduate  [ ] Postgraduate  [ ] CME  
[ ] Other (specify): ___________________________

How much emphasis should CME speakers place on presenting research results when making therapeutic recommendations?  
Very little ------------------------------------------------ Some ------------------------------------------------ A lot  
1  2  3  4  5
   [ ] [ ] [ ] [ ] [ ]

Comments:
Resident-driven Quality Improvement Pre-post Intervention Targeting Reduction of Emergency Department Decision to Admit Time

Rahim Kachra MD, Alison Walzak MD, Stacey Hall MD, William JA Connors MD, Katherine A Eso MS, Alejandra Boscan MD, Fiona Clement PhD, Jayna M Holroyd-Leduc MD

About the Authors

The authors are all affiliated with the University of Calgary, Calgary, Alberta. Rahim Kachra, Alison Walzak, and Alejandra Boscan are Clinical Assistant Professors in the Division of General Internal Medicine, Department of Medicine. Stacey Hall is a Clinical Assistant Professor in the Section of Geriatrics, Department of Medicine. William JA Connors is a Clinical Lecturer in Infectious Diseases, Department of Medicine. Katy Eso is a Research Assistant with the Ward of the 21st Century. Fiona Clement is an Associate Professor of Health Economics and Policy in the Department of Community Health Sciences. Jayna M Holroyd-Leduc is an Associate Professor with the Departments of Medicine and Community Health Sciences and the Section Chief of Geriatrics.

Abstract

Long Emergency Department (ED) wait times represent a key point for quality improvement in many healthcare systems. A delayed ED disposition decision may lead to increased length of hospital stay, healthcare cost, and mortality. The objective of this resident-driven quality improvement (QI) intervention was to determine if a standardized resident admission protocol could reduce the ‘decision-to-admit’ (DTA) time of patients being assessed for admission to internal medicine (IM) at 3 tertiary care teaching hospitals.

A standardized admission protocol was developed by a focus group of senior IM residents. DTA time data were tracked over a 6-month period, following implementation of the intervention. Residents identified potential barriers to timely DTA. A regular electronic newsletter summarized DTA time trends and reinforced the admission protocol. All data were extracted in aggregate form from a regional health authority database.

There was an overall decline in DTA times for Medical Teaching Unit (MTU) admissions with our intervention. Over a 6-month period, when adjusted for junior learner numbers and admission volumes, DTA times at all 3 sites decreased by an average of 1.3 hours. Cost effectiveness analysis using a case mix group model yielded an average cost savings of $36.63 per admitted patient across the 3 sites. Reported barriers to admission included unclear patient disposition, high consult volume and unstable patient status.

We have shown that a resident-driven QI intervention can be effective in reducing DTA times, and is cost saving to the healthcare system.

Keywords: Emergency department, hospital medicine, hospital quality improvement, cost effectiveness
Introduction

Wait times have become a central public policy issue and a focus of both national and international healthcare reform. Timely access to care has been identified as an indicator of healthcare quality, leading to the development of wait time benchmarks by many health authorities. Delays in access to care occur for many reasons across the spectrum of health care services.

The emergency department provides essential healthcare services to a large volume of patients and serves as the primary point of access to hospital-based care. In Canada alone there are close to 16 million ED visits each year with over 1 million resulting in hospital admission. A patient’s length of stay in the emergency department is comprised of 5 major stages: registration, triage, physician assessment, determination of disposition, and discharge or transport from the ED. In this setting, ‘length of stay’ (LOS) is meant to be an inclusive metric encompassing both the time a patient spends waiting for care and the time required to provide care.

Increases in ED LOS have been shown to have a negative impact on both the patient and healthcare system. Patients waiting longer in the ED are more likely to experience pain and suffering, express dissatisfaction with care, and leave without receiving treatment. For those requiring hospital admission, prolonged ED LOS may result in ED overcrowding, which has been associated with an increase in short term mortality. At a healthcare system level, increases in ED LOS for those requiring admission to hospital is associated with significantly increased in-patient length of stay and cost.

The aim of this intervention was to reduce ED LOS through targeting reduction in the decision to admit (DTA) time for patients being admitted to Medical Teaching Units (MTU) at 3 urban teaching hospitals. DTA time was defined as the time from initial internal medicine consultation to the electronic entry of admission orders. A 2-hour DTA time target was chosen based on an established provincial target within a national 8-hour total ED length of stay benchmark. The primary improvement-related question was to determine if the creation of a standardized admission protocol by senior internal medicine residents and regular distribution of average DTA times to residents would decrease ED LOS. Our secondary improvement-related objectives were to identify barriers to a timely DTA, and to identify potential cost savings.

Methods

A prospective pre-post QI experimental study was conducted at 3 academic teaching hospitals from July 2012 to February 2013. All 3 hospitals are academic centres. Two of these hospitals have 3 MTUs. At these sites, senior residents (post-graduate year [PGY]-2 and PGY-3) are responsible for ED admissions 24 hours a day. The third hospital has 2 MTUs, with a senior resident responsible for ED admissions from 8pm until 8am, and a staff physician at all other times. All MTUs have junior trainees (either PGY-1 residents or senior medical students).
Planning the intervention

During the study period there were 55 senior internal medicine residents (PGY-2 and PGY-3) enrolled in the Royal College of Physicians and Surgeons (RCPSC)-accredited Internal Medicine Residency Training program. All 27 PGY-3 residents were invited to participate in a focus group, facilitated by the internal medicine chief residents, in which the following 4 questions were discussed:

1. What are the current barriers to making admission decisions within a 2-hour time period?
2. How might patient care be affected if time to admission was shorter?
3. What patient situations may be exceptions to the rule of early admission decisions?
4. What strategies might reduce time to admission decisions?

Responses to these questions informed the creation of a standardized admission protocol (Appendix 1) that was approved by the 4 internal medicine chief residents and the department of medicine division heads. We also created a feedback form that enabled senior residents to anonymously report types of admission barriers, estimated associated time delays and outcome of admission barriers (Appendix 2).

Intervention

The standardized admission protocol was disseminated to senior residents by email, placed on the internal medicine training program website, and discussed at an academic educational half-day. An electronic newsletter was created that included the admission protocol, current average DTA times and trends at all 3 study sites, and information about identified barriers to admission. This was emailed to all senior medicine residents every 6 weeks by the project coordinator to remind them of strategies to employ when admitting patients from the ED, and to provide DTA summary data. Residency program information was also included in the newsletter to promote readership.

DTA data were extracted in aggregate form from Tableau (a regional health authority de-identified database) over 8 training blocks (1 training block is 4 weeks), with the first 3 blocks providing baseline data.

Barrier-to-admission feedback forms were made available to residents both electronically on the program website, and in hard-copy at all 3 sites. They were submitted in centrally located envelopes to preserve anonymity. No resident identifying information was collected on these forms.

Evaluation and Analysis

The average DTA times (in fractional hours) for MTU admissions by site were calculated for every training block. To adjust values for junior learner number and admission volumes, the average DTA time per junior learner was divided by the number of admissions. P-values and confidence intervals on the raw DTA times by site could not be reliably determined because there were not enough observations per site.

Cost effectiveness was calculated using a case mix group model, with groupers and resource intensity weights as developed by the Canadian Institute of Health Information (CIHI). The percent of admissions classified under each grouper and the average length of stay per site in hours were obtained from Tableau. Provincial data were used for average admission cost. Cost savings were based on the decrease in time to admission.

Given this was a QI project and no identifying data were collected, a letter of comfort was obtained from the Conjoint Health Research Ethics Board at our institution. No potential author conflicts of interest were identified.

Results

Over the 6-month intervention period, there were an average of 2.84 admissions at site 1, 3.57 at site 2, and 3.62 at site 3, per 24 hours. The unadjusted DTA times at 2 of our 3 sites decreased from an average of 4.3 and 4.2 hours to 3.2 and 3.3 hours, respectively. The third site experienced a slight increase from 3.1 to 3.2 hours. However, when accounting for number of junior trainees and admission volume, all 3 sites experienced a decrease in DTA times (4.8, 4.0, and 1.8 hours to 2.4, 2.6, and 1.7 hours, respectively), as shown in Figure 1. Overall, across all 3 sites, adjusted DTA times were reduced by an average of 1.3 hours. Cost effectiveness analysis yielded approximate healthcare cost savings of $59.18 per admission at site 1, $43.29 at site 2, and an increase in cost of $5.29 at site 3. Overall, this is an average cost savings of $36.63 per admitted patient across the 3 sites.

A total of 28 barrier-to-admission feedback forms were returned. The 3 most common reasons for prolonged DTA were unclear patient disposition, high consult volume, and unstable patient status. The estimated delay to admission as a result of these barriers ranged from 1.3 to 8.0 hours.
Discussion
In our study, we demonstrated that a resident-driven intervention to reduce DTA time of patients admitted to medical teaching units was effective across 3 teaching hospitals. This finding is similar to a previously published Canadian QI study involving internal medicine trainees at one academic teaching hospital. However, this study differed in the extent of resident involvement in design and implementation of the intervention. Although electronic dissemination of performance metrics has previously been shown to decrease overall ED LOS in the surgical literature, the focus has been on decreasing time to consultation and not DTA times.

Although all 3 sites demonstrated a decrease in DTA times, site 3 was noticeably different showing a smaller decrease in adjusted DTA time from 1.8 to 1.7 hours. Site 3 also had the highest average number of admissions to MTU. Rathlev et al. found that the number of ED admissions is positively associated with increased ED LOS, and this may account for a portion of our results. However, the MTU structure is also different at site 3 as a staff physician is responsible for admissions between 8am and 8pm, with a senior resident covering from 8pm until 8am. Perhaps the efficiency of staff admissions explains the consistently low average DTA times at this site, which was already below the 2-hour target at baseline.

We demonstrated an overall cost savings with this intervention. This builds on previous findings from Foley et al. that demonstrated increasing ED LOS by 11.7% increased the costs at a university facility by $3.9 million per year. The costs associated with developing and implementing our intervention were minimal, primarily reflected in human resources required for data analysis and the creation and dissemination of a regular electronic newsletter, thereby strengthening the cost efficacy benefits.

Another valuable outcome of this study was insight into barriers to achieving the targeted 2-hour DTA time. The barriers identified may be useful in developing future models to reduce DTA times. However, it is likely not a comprehensive account of the barriers, as resident reporting of barriers was voluntary.

This intervention also demonstrates the importance of involving relevant stakeholders in QI initiatives. Within many academic hospitals, residents are often the individuals making admission decisions and have comprehensive understanding of ED admission processes. Therefore, it is not surprising that involving residents in this QI intervention resulted in positive change.

There are some potential limitations to this study. Although a multi-centre study, our 3 sites were located within the same city and involved only one residency-training program. This may limit the generalizability of our findings. Additionally, the impact of our intervention on the trend in DTA time reduction could be overestimated by concurrent improvement in senior resident efficiency at clinical assessment over the study period, as it coincided with progression in training. Finally, we do not have data on what proportion of residents actually read the electronic newsletter and standardized admission protocol. A simple survey conducted at the end of the intervention may have provided more insight into the uptake of the intervention among residents thereby allowing a more informed interpretation of the data.

In conclusion, this relatively simple and low-cost QI intervention, aimed at reducing DTA times, resulted in decreased DTA times and related cost savings. The identified barriers to residents’ DTA may serve as targets for future site- or system-wide interventions.
Funding
Funding was provided by Alberta Health Services – Calgary Zone Medical Affairs. The sponsor had no role in the collection, analysis and interpretation of the data; in the writing of the report; and in the decision to submit the paper for publication.

Acknowledgements
Contributors: Jeffrey P Schaefer MD, Maria Bacchus MD, Peter Jamieson MD, Barb Kathol

Competing Interests
Dr. Holroyd-Leduc receives salary support as the Scientific Director of Alberta Health Services

References
Appendix 1

Department of Medicine In-patient Services
Process for Emergency Department Admissions

Preamble:
The intent of this protocol is to enhance patient care and shorten the emergency department admission process. The following outlines general principles for emergency department consultations to Department of Medicine (DOM) in-patient services.

General Principles:
For each consultation received from an emergency physician within any of the Calgary Emergency Departments:

1) The senior resident/fellow (or staff physician when appropriate) assigned to cover emergency department consultations will conduct an initial triage of the patient and make a decision around admission, before assigning the consult to a junior trainee to complete. This should be done within two hours of the initial request for consultation. The senior resident/fellow may speak to the attending staff physician before making this decision; however this should be done in a timely manner so as not to unduly increase the time it takes to make a decision around admission. A decision to admit may be delayed until it is clear that admission to a DOM in-patient service is appropriate if another consulting service is also assessing or should be consulted to assess the patient for possible admission.

2) The senior resident/fellow (or staff physician) should enter initial admission orders into Sunrise Clinical Manager (SCM), including all essential orders that would be needed if the patient were to be transferred to the medical unit before the junior trainee finishes their assessment. These orders should include any qualifiers around delaying transfer out of emergency department when appropriate, such as but not limited to the clinical scenarios listed below:
   a) Severe DKA (e.g. pH <7.1)
   b) Required/recent hemodynamic or ventilatory support (e.g. BiPAP; vasopressors; recently extubated)
   c) Active unstable upper GI bleeds
   d) Drug overdoses with altered level of consciousness
   e) Severe sepsis/septic shock with no signs of improvement after adequate resuscitation

3) When entering these initial admission orders, the senior resident/fellow is encouraged to include an MD to nurse communication: “ED nurse or unit clerk to please page Senior Medicine/Fellow pager (pager #_____) leaving a text message when patient is about to be transferred to a unit”

4) When available, a junior trainee should be assigned to complete the full admission assessment, which will be reviewed with the senior resident/fellow (or staff physician) when completed. If stable, the patient can be moved to a medical bed before the junior trainee has completed their assessment, as the assessment can be completed on the medical unit. The trainee should be encouraged to complete their assessment in a timely manner.
### Appendix 2: Barriers to Admission Feedback Form

<table>
<thead>
<tr>
<th>Specific barrier to admission</th>
<th>Number of times this occurred</th>
<th>Estimated delay to admission decision for each occurrence (minutes)</th>
<th>Outcome (eg. to ward, to ICU, discharged, etc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient referred without initial investigations ordered</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unclear disposition (MTU vs. hospitalist, etc). Specify other services:____________________</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Possible discharge from emergency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worrisome lab result (eg. pH&lt;7.2, elevated lactate). Specify lab result(s):________________</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unstable patient status</td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Awaiting test results. Specify test(s):__________________________</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High volume of consults</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Managing other acutely ill patient</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difficulty completing investigations on MAU patient (RGH only)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (please specify:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Morning Report iBook™ – A Novel Approach to the Internal Medicine Morning Report

Zachary Liederman MD, Francis Patafio MD, Jordan Green MD, Ross Morton MD, David Taylor MD.

About the Authors
Zachary Liederman, Francis Patafio and Jordan Green were Chief Internal Medicine Residents in the Department of Medicine at Queen’s University, Kingston, Ontario. Ross Morton is Chair Nephrology, Morning Report Faculty Lead in Department of Medicine, Queen’s University. David Taylor is with Department of Medicine, Queen’s University. Correspondence may be directed to: taylord@queensu.ca

Abstract
Background: Morning Report is an integral element of residency education, however, changes in training have limited its effectiveness. To improve the effectiveness and accessibility of Morning Report, we developed an innovative electronic teaching resource.

Program Description: Using best practice guidelines for e-learning, we created virtual cases based on patients previously presented at Morning Report. Each case includes a summary of the patient’s clinical presentation, and interactive features which examine the patient’s history, physical examination and investigations. Practice exercises challenge learners throughout. Cases finish with an expert summary of the patient’s clinical outcome at discharge.

Results: Residents felt that the tool was easy to use, had high learning value and was an excellent adjunct but not replacement to traditional Morning Report sessions. Specifically, 45% of residents responded that the tool improved their learning in traditional sessions.

Discussion: Our teaching tool supports trainees as an easy-to-use, high fidelity electronic resource that actively involves learners of all levels.

Résumé
Contexte : Le rapport du matin fait partie intégrante de la formation des résidents. Toutefois, des changements en matière de formation limitent son efficacité. Pour améliorer l’efficacité du rapport du matin et son accessibilité, nous avons élaboré une ressource d’enseignement électronique novatrice.

Introduction

Morning Report is a longstanding and highly valued component of graduate medical education. While highly variable in organization, at its core, it is a case-based conference in which the facilitator (typically a chief resident or faculty member) challenges residents on the assessment and management of cases from the department’s clinical teaching services. At our institution, a senior faculty leads Morning Report and each session deals with an approach to a clinical case of a patient admitted to the clinical teaching service. The session is approximately 45 minutes and occurs 3-5 times per week. All medical learners (clinical clerks and residents) rotating through General Internal Medicine or a medical subspecialty are expected to attend.

Changes in residency training have begun to erode the traditional implementation and impact of Morning Report. Expansion of medical training programs, duty hour restrictions, and distributed medical education all present challenges to resident participation in Morning Report. Review of the training schedules at our institution revealed that learners are only available to attend 50% of sessions due to these challenges. This is a concerning finding that has emerged in our struggle to balance education with clinical service needs.

A major positive change in medical education over the past decade has been the adoption of online and electronic teaching tools, either blended with or replacing traditional teaching methods. Use of education technology resources can help create innovative solutions for the teaching challenges described above. Through our academic roles in the Department of Internal Medicine at Queen’s University (chief residents and faculty leads for Morning Report) we recognized a strong need within our own institution to increase participation in Morning Report. We looked to available education technology resources to design an alternate approach. Incorporating available education technology and using best practice guidelines for e-learning, we developed an innovative electronic teaching resource to present Morning Report in an engaging and learner-centered format.

Program Description

Here, we would like to describe how we developed and distributed our Morning Report teaching tool with an emphasis on creating a framework for high value case based electronic teaching.

Case Recruitment and Selection

In total, 10 cases that had been presented at Morning Report teaching sessions were selected for inclusion. Appropriate consent was obtained for all patients.

Medical education literature shows that the criteria used in case selection for Morning Report conference vary widely from program to program. In the absence of published guidelines, we targeted cases to create a resource that had the following features:

1) Novel presentations of common disorders.
2) Uncommon disorders important to consider with common presentations.
3) Reinforcement of high-value care.
4) Rich use of relevant multimedia (e.g., videos, imaging, pathology, etc).
5) Review of core resident competencies across multiple disciplines of internal medicine.
6) Diversity across multiple disciplines within internal medicine.

Case Development

The electronic cases and chapters were developed using iBook Author, which is available as a free download in the Apple App Store. Reviewing the needs of our trainees as well as best practice principles for electronic learning resources, our teaching resource focused on the following elements.

1) Step-wise approach

Elements of the case are provided in a sequential manner to simulate the way information is collected and analyzed during real patient encounters. Internal medicine residents

Résultats : Les résidents estiment que l’outil proposé est facile d’utilisation et de grande valeur didactique, en plus de constituer un excellent complément d’apprentissage. Mais il ne remplace toutefois pas les traditionnelles séances portant sur le rapport matinal. Plus particulièrement, 45 % des résidents ont spécifié que l’outil proposé les aidait à mieux tirer profit des séances traditionnelles.

Discussion : Notre outil pédagogique est d’un bon soutien pour les apprenants en tant que ressource électronique facile d’utilisation et de haute fidélité. Il permet aux apprenants de tous les niveaux de prendre une part active dans leur formation.
have previously reported this as the preferred method of case analysis. All case presentations include the reason for referral, the history of presenting illness, past medical history, medications, physical exam, laboratory values, other relevant studies, and treatment plans. The reader is challenged to develop diagnostic considerations and management plans early on in the case, and then revise them as new information becomes available (Figure 1).

2) Interactivity & Feedback
Interactivity is an important quality for effective learning and has been listed as a key component in both case based and online teaching. Furthermore, this was identified as a learner priority through focus group sessions at our institution with senior medical students (unpublished study). In these focus groups, students frequently described decreased participation due to fear of getting questions wrong and being embarrassed. By maximizing the interactivity of our learning tool we hoped junior learners would gain, confidence experience and skills in a supportive virtual environment. Our goal is that more confident junior learners will engage actively in traditional Morning Report teaching sessions.

We established a platform for interactive participation through multiple methods. First to simulate a real patient encounter and engage learners we incorporated a variety of high fidelity multi-media elements. This included, videos and images of physical exam features, radiology and electrocardiograms (Figure 2).

Additionally, the iBook™ includes practice questions throughout each case, challenging learners as they work through them. These questions serve as an essential educational element to promote learner engagement within the resource. To ensure engagement was complemented with feedback, a detailed description of why items were right or wrong was included for every question.

Figure 1. Students are able to practice their interpretation of ECG (1a) and radiological imaging (1b). Students can receive direct feedback regarding their interpretation by clicking over specific findings. By clicking on the bottom they can read a description of the pathophysiology and clinical significance behind the abnormal findings.

Figure 2. The inclusion of video, in this case physical examination features (JVP assessment – 2a) and diagnostic testing (echocardiogram – 2b), allows for a more realistic simulated patient experience and increased learner engagement. Furthermore, these demonstrate how multiple tiers of learners can learn from a single case. For example, using figure 2a as an example, junior learners can learn how to visualize the JVP while more experienced learners can focus on the significance of different JVP waveforms. Overall, the inclusion of high fidelity videos and level appropriate learning material contribute to improved learner engagement.
Previous work shows that senior residents often feel that their educational experience is diluted by inclusion of junior learners in Morning Report sessions. The electronic format of our teaching resource allowed us to meet the needs of trainees at all levels by including questions with varying difficult levels. Tiered questions encouraged active participation and guarded against students becoming disengaged with questions that were too simple or difficult. Questions were further designed to reinforce learning points through repetition and practice. We used a variety of questions types including multiple choice and open-ended questions.

3) Patient Follow up
The recent implementation of residency duty hour restrictions make it more difficult for learners to clinically follow patients they admit throughout their patients hospitalization. Similarly, traditional approaches to Morning Report often present patients soon after admission and are unable to provide learners with the outcomes of clinical decisions that were made. To address this, our resource included the full clinical course and final diagnosis for each case, sometimes following patients for months after their admission. This provided high quality outcome-oriented feedback and established a structured format for learners to bring their case experience through to conclusion.

4) Expert Opinion
Attending physicians and senior residents provided short reviews for the diagnosis at the end of each case. These summaries were written to reinforce the clinical teaching points of the case and provided links to online guidelines and journals. This further anchored the teaching points in evidenced-based medicine and encouraged learners to pursue independent study.

Program Evaluation
Following the online release of our teaching tool we asked all internal medicine residents at our institution to participate in a survey to assess the usability and educational effectiveness of the teaching tool.

The anonymous survey was conducted online using Survey Monkey. The questionnaire consisted of both open-ended, multiple choice and rating scale questions. There were 6 multiple choice questions to gather demographic information and baseline use of both traditional Morning Report and the electronic Morning Report. There were two rating scale questions. One assessed the relationship between our electronic resource, traditional Morning Report and clinical practice. The second rating scale question asked respondents to rate the educational impact of individual teaching components of the electronic Morning Report book. The open-ended questions described below prompted respondents to further expand on these themes.

1. How would you best describe the relationship between the Morning Report iBook and traditional in person Morning Report at Queen’s? (i.e If they are interchangeable, the Morning Report is a good adjunct etc.)

2. How has the Morning Report iBook impacted clinical care? Please use specific examples.

In total, 17% of residents responded (11/ 64) to the survey. Of respondents 45% were in their third year of residency, 27% were in the second year and 27% were in their first year. All respondents described attending Morning Report regularly when possible and 91% had spent significant time using the electronic Morning Report tool.

The majority of residents (82%) reported using the teaching tool on an iPad™ platform. In addition to using it as a virtual, case-based learning tool, 55% of residents also used it as a medical reference when encountering difficult cases. Residents felt that the tool was very easy to navigate and all teaching components were evaluated as having moderate to high educational value.

Almost half of respondents (45%) felt that the electronic Morning Report would lead to improved learning in traditional Morning Report sessions and 36% believed it would specifically increase their participation in these sessions. Lastly, most respondents felt that an electronic Morning Report was an excellent adjunct but not replacement to traditional Morning Report sessions.

Discussion
The changing landscape of medical education presents both multiple challenges to effective teaching as well as the possibility for innovative solutions. In particular, traditional educational methods that rely on small group discussions such as Morning Report are at risk of being squeezed out. Our teaching resource capitalizes on the accessibility of electronic-based teaching to successfully provide an educational adjunct to traditional Morning Report sessions. Our teaching resource incorporates expert opinion and is grounded in best practice principles of case based and electronic learning. Furthermore,
the incorporation of our electronic teaching resource compliments other online approaches such as a Morning Report blog, which has previously been shown to be effective in improving learning outcomes. Overall, The Queen’s Electronic Morning Report supports our trainees as an accessible, high fidelity resource that actively involves learners of all levels and complements traditional teaching methods.

Limitations of this work currently include a limited amount of data for program evaluation and the single-center experience currently. Moving forward we hope to obtain objective learner outcomes to further assess the impact of this innovation.

The Morning Report e-resource can be accessed on iTunes: “Queen’s Morning Report”, or through the QR below.

References:

Acknowledgements
Contributors: The authors would like to acknowledge Dr. Jeff Wilkinson who provided the original idea behind the Morning Report iBook and was instrumental in developing the first three editions.
Preparing General Internal Medicine Residents for the Future – Aiming to Match Training to Need – A Pilot Study in Saskatchewan

Sharon E Card MD, MSc, FRCPC, Founder GIM, Heather A Ward MD, MSc, FRCPC; Lindsey Broberg

Abstract
Health care workforce planning is difficult. It is even more so for a generalist specialty such as General Internal Medicine (GIM) as a key feature, worldwide, is the ability and desire of General Internists to adapt to the needs of their local context. Although this adaptability is an important resource for health care systems, it must be planned for in GIM educational curriculums. A pilot study in our province indicates that there are a broad range of competencies that all regions wished for in graduates of GIM programs. There were, however, many varied local needs that must be planned for in addition to ensuring all graduates have the broad skill set of GIM. Regions desired to employ true generalists with potentially an added skill. To truly ensure GIM graduates meet future societal needs will require ongoing links between health intelligence data and curriculum planning.

Key Words: workforce planning general internal residency

Résumé
La planification des ressources humaines en santé s’avère chose difficile. Ce l’est d’autant plus dans le cas d’une spécialité généraliste telle la médecine interne générale (MIG) car celle-ci se caractérise par la capacité et le désir qu’ont les internistes généralistes de s’adapter aux besoins dans leur contexte local. Cette faculté d’adaptation constitue une richesse importante au sein des systèmes de soins de santé, mais elle doit faire l’objet d’une préparation dans les programmes d’enseignement en MIG. Une étude pilote effectuée dans notre province indique que l’ensemble des régions a des besoins communs en matière de compétences des diplômés des programmes de MIG. Toutefois, les besoins sont souvent variés et locaux, et il faut prévoir que la formation offerte aux étudiants leur permettra de disposer de toutes les compétences propres à la médecine interne générale. Les régions souhaitent employer de vrais généralistes ayant potentiellement quelques compétences supplémentaires. Pour garantir que les diplômés de MIG sont en mesure de répondre aux besoins futurs de la société, il faudra entretenir des liens constants entre les renseignements disponibles sur les besoins en santé et la planification des programmes.
Introduction
Health care workforce planning is difficult and often inaccurate. Predicting the roles and numbers of physicians needed in the workforce is a difficult task, as reflected by the scarcity of data providing comprehensive predictions. Despite its challenges, correctly predicting the needs of the health care system is extremely important for medical student career planning and robust health system planning. Planning could potentially ensure that the right provider is present for the right patient at the right time.

The future health care workforce will need to evolve to meet the increasingly complicated health needs of the population. Despite alleged differences in the operationalization of General Internal Medicine in different countries, a central unifying feature of the discipline throughout the world is the adaptability of its practitioners to meet population needs. As defined in the Royal College of Physicians and Surgeons of Canada (RCPSC) Objectives of Training, GIM “embraces the values of generalism, is aligned with population needs, and promotes the practitioner’s ability to adapt their practice profile when needs change.” It is this adaptability to context that strengthens the value of GIM to the health care workforce. We submit, however, that this further constrains health care workforce planning for GIM due to the variation in practice patterns in the same geographic region, and the variation in health needs and health professional distribution between geographic regions. GIM is a discipline that like “psychiatry can continue to create an almost inexhaustible demand for psychiatric services by increasing the boundaries of its scope of practice”. To ensure a sustainable practice for individual providers, and for the system at large, GIM education must be designed to address true societal needs in collaboration with other health care providers.

Predicting Future Health Care Provider Needs
There are many features of the healthcare system that are inherently difficult to predict, making health care provider resource needs projections problematic. The ability of a geographic location to support a particular specialty or procedure depends on the amount of resources available to fund hospital beds, operating room space, and specialized equipment, which may vary from year to year as the economy fluctuates. The economy also impacts when physicians will retire.

A number of different methods have been used in an attempt to match physician supply to physician need, with variable success and many difficulties. The scope of practice of General Internists is designed and anticipated to change depending on regional variations in population health needs, and the availability of support from other specialists and health professionals. As other specialties become trained to provide services that physicians provided in the past, it creates a reduced need for physicians to fill these roles. This adaptability further complicates in the short term, but potentially enhances in the long-term health human resource planning in GIM.

Despite these limitations in physician human resource planning, there have been strong recommendations in both the United States and Canada to strengthen the generalist workforce in both countries. The end result of the ideal GIM residency training program is the production of adaptable and competent physicians that are ready to practice immediately upon completion of a GIM residency.

Future Links Between Health Human Resource Planning and Postgraduate Residency Training in GIM
If we are to train GIM residents for the reality of their future practice, we first need to develop a method to predict the demand for GIM specialists and identify the current and future scopes of practice of GIM. General Internal Medicine has evolved in terms of its operationalization across the world (primary care versus consultant; ambulatory versus inpatient) however; the values expressed by GIM are consistent across the world. Canada emphasizes generalist skills and the ability to adapt; SGIM in the United States is broad scope of practice and adaptable training; ability to deal with a broad range of problems is emphasized in New Zealand and Australia.

Cited from Bill Ghali: “Borrowing metaphorically from the field of biostatistics, it seems that the existing ‘within-country variance’ in GIM profiles is not all that different from the ‘between-country variance’.”

We conducted a mixed methods study to anticipate the needs for GIM throughout the province of Saskatchewan by identifying:
• Range of scope of practice of GIM (both current and perceived) to align the University of Saskatchewan GIM subspecialty training program objectives with competencies needed in practice.
• Future human resource needs within the discipline of GIM in our province.

Quantitative and qualitative data were gathered from at least one of the following in each of the 12 health regions in the province: practising General Internist; recruitment/administrative personnel; and/or administrative personnel. A total of 22 in-depth interviews were completed (12 of recruitment/administrative personnel and 10 of practising General Internists).
Hypothesis Generating Themes from Interviews
There is an anticipated need for General Internists within the next 10 years in all health regions that currently employ GIM. There was also difficulty establishing an exact number of General Internists needed in any future time frame (including within the next year) due to uncertainties in physician recruitment and retention as well as changing health region needs (example: need for expansion of GIM roles in ambulatory care). There was a consistent reactive-versus-proactive approach to planning GIM recruitment (example: unable to anticipate if current MDs would stay in a community, resulting in attempts to fill vacancies after a physician left).

As anticipated, the current scope of practice of GIM is widely variable across the province and at different practice location types. There were however areas of commonality in scope of practice across regions which are indicated in Table 1. Competency in cardiac, gastrointestinal, respiratory and cerebrovascular diseases were felt to be consistently important due to the prevalence of these disorders in the province. Particularly in regions outside of Saskatoon and Regina (urban centres), critical care skills were identified as being vital for a General Internist. The need for a broad scope of practice was also emphasized. In short, respondents perceived that General Internists must possess the full generalist scope of practice (Table 1) instead of subspecializing, with the ability to further add to this broad scope to meet the health needs of their patients.

Although a large number of essential competencies were felt to be well established for all GIM graduates (Table 1) there were also many skills that regions identified that they desired to have filled by GIM in an expanded fashion. These lists of areas of expanded skills were different in each region. Several skills (example: dialysis support, endoscopy) were only needed in one region and not in any others. For our province, the main themes of desired expanded skills were: expanded clinical skills (example: diabetes care); medical education; research; health care service delivery innovation; obstetrical medicine; and several procedural skills (example: echocardiography).

All respondents, however, emphasized that it was desired that these expanded areas were in addition to the essential skills. In other words, all graduates needed to retain a broad scope of practice. Adaptability in practice was also reinforced by 78 % of General Internist respondents indicating that their practice had changed over time. All regions identified a need for expansion of the role of GIM in the ambulatory care setting. This included suggestions for chronic disease clinics; multidisciplinary complex care clinics; preventive health care; diabetes; obstetrical medicine; care of persons with genetic disorders now living to adulthood; specific disease areas such as alcoholic liver disease; congestive heart failure; chronic renal insufficiency.

Despite the wide variation in the number of procedures performed by General Internists in their practices, respondents placed great emphasis on the importance of procedural skills and the need for residency training to allow sufficient opportunities to improve these skills. There were suggestions that there be a greater amount of training dedicated to the development of procedural skills during residency. This was postulated to instill confidence and competence in procedural skills that is necessary to enable new graduates to practice in rural and remote locations.

Planning Future Training
Entering the competency-based era, the overall goal of GIM programs -- and thus the program outcomes -- are “graduates with multi-faceted abilities that meet the needs of those served”. Previous studies via job task analysis and expert consensus have initiated understanding of the role of the Canadian General Internist. Our pilot study demonstrates the need for ongoing planning and matching education with societal needs.

Conclusions
A recurrent theme of the skills and attitudes that General Internists bring to the health care environment world-wide is a combination of a broad scope of practice but at the same time an adaptable set of skills unique for each practitioner for their own community. To fully understand GIM health human resource planning, an understanding of the range of scope of practice in each community that a residency program serves is needed. Linking GIM training with societal needs via ongoing health intelligence would be ideal. (Figure 1) There is an urgent need for regional and national Health Intelligence to assist with postgraduate education planning nationally, regionally.

Table 1. Current and Desired Scope of Practice for ALL GIM Graduates – Essential Skills.

| Diagnosis and initial management for all Internal Medicine (IM) conditions presenting acutely. |
| Inpatient care – ill patients with IM conditions either as most responsible physician or consultant. |
| Ambulatory care – common IM conditions; Multisystem Disease; Risk Reduction (example hypertension, lipids). |
| Common and Emergency IM conditions around the time of pregnancy. |
| Perioperative Care. |
| Life Saving and Diagnostic Procedures. |
and for individual residents. As Canadian postgraduate training programs undergo transformation to competency-based education, there is an ideal opportunity to look at the outcomes of residency programs. For GIM, we suggest that this should include a targeting of individual residents to individual positions, while still ensuring that all have a broad base of generalist scope of practice.

**Acknowledgements**

We are grateful to all the participants for their time and frank discussion. This study was presented at the SGIM Meeting in Toronto April 2015.

Figure 1. A Vision for the Future of GIM Residency Programs – Linking Training to Needs.
General Internal Medicine Training and Needs

References


2. Frank JR and Harris KA, eds. Competence by Design; Reshaping Canadian Medical Education. Ottawa: Royal College of Physicians and Surgeons; 2014.


10. The Canadian Society of Internal Medicine. CARE-FULLY: Defining a Plan for General Internal Medicine in Canada. May be viewed by contacting The Canadian Society of Internal Medicine http://csim.ca/contact-csim/


The Moncton Hospital, a facility within Horizon Health Network, is recruiting an Endocrinologist or Internal Medicine Specialist with equivalent expertise and practice. Services include an active diabetes clinic with three full-time nurses including a certified insulin pump instructor, two full-time dietitians, a part-time social worker and a part-time pharmacist. Also available is a lipid lowering clinic and thyroid nodule clinic with capacity for ultrasound-guided FNA. Call will be shared with the 15 specialists in the Department of Internal Medicine.

The Moncton Hospital is a 386-bed tertiary and critical care facility within Horizon Health Network. It is a major referral hospital which serves communities throughout New Brunswick, Prince Edward Island and northern Nova Scotia. The Moncton Hospital is one of two neurosurgery centers for the province and provides pituitary surgery for PEI, western Nova Scotia and eastern New Brunswick, and has a number of ENT surgeons performing thyroid surgery. There is ample opportunity to have a rich and comprehensive practice.

The city, with adjoining municipalities, has a population of more than 138,000, and was ranked as one of the best Canadian cities for quality of community life. There is an abundance of educational, cultural and recreational opportunities including easy access to warm water beaches of the Northumberland Strait, and also the scenic Bay of Fundy area. Visit the City’s website at www.moncton.ca.

Requirements:
The Department of Internal Medicine requires that its members practicing Endocrinology or Internal Medicine have passed the examinations of the Royal College of Physicians and Surgeons of Canada or the examination of la Corporation professionnelle des médecins du Québec. In circumstances where no Canadian trained applicants are available, the Department will consider physicians with American Boards who are able to obtain licensure in the State of Maine. In special circumstances, foreign graduates who qualify for licensure in the Province of New Brunswick will be considered.

Remuneration:
Standard remuneration is fee-for-service which is a direct compensation between the physician and Medicare of New Brunswick. No source deductions can be provided. However, under special circumstances, with approval from the Department of Health of New Brunswick, a salaried model may be available. This may range between a minimum of $221,078 to a maximum of $268,788 annually (excluding benefits and source deductions) based on qualifications and experience. Locums receive 10% in lieu of benefits. On call remuneration is fee for service.

Applicants are invited to forward their CV to Dr. Ken Mitton, Medical Director, 135 MacBeath Ave., Moncton, NB E1C 6Z8, fax (506) 857-5545, or email at medical.staff@horizonnb.ca.
Hyponatremia Due to an Interaction Between Hydromorphone and Desmopressin in a Patient with Central Diabetes Insipidus: A Case Report

Gillian Mazzetti MD, Oren Steen MD, Ameen Patel MD, Natalia McInnes MD

Abstract

There are case reports of opiate-induced hyponatremia thought to be mediated by increased secretion of antidiuretic hormone. We report a case of hyponatremia in a woman with central diabetes insipidus treated with desmopressin after receiving large doses of hydromorphone which suggests a different mechanism of opiate action.

A 55-year-old woman with central diabetes insipidus presented to hospital with an asthma exacerbation, later complicated by intestinal perforation requiring surgery. She received hydromorphone for pain for 3 weeks before surgery, but her requirements increased after surgery. Her serum sodium subsequently decreased, reaching a nadir of 119 mmol/L. Hydromorphone and desmopressin were discontinued, and she was managed with fluid restriction, a 3% saline infusion and intravenous vasopressin.

This suggests that hydromorphone may interact with desmopressin to potentiate its antidiuretic effect. Furthermore, hydromorphone may contribute to hyponatremia by another mechanism rather than by increasing production of antidiuretic hormone.

Résumé

Selon certaines observations cliniques, l’hyponatrémie provoquée par l’administration d’opiacés pourrait être modifiée par l’augmentation de la sécrétion de l’hormone antidiurétique. Nous présentons un cas d’hyponatrémie chez une femme atteinte de diabète insipide par carence en hormone antidiurétique et traitée à l’aide de desmopressine après avoir reçu d’importantes doses d’hydromorphone, ce qui nous amène à réfléchir à la possibilité d’un mécanisme d’action des opiacés qui serait différent.

Une femme de 55 ans atteinte de diabète insipide par carence en hormone antidiurétique se présente à l’hôpital faisant une crise d’asthme, qui sera ultérieurement compliquée d’une perforation intestinale nécessitant une chirurgie. Elle prend de l’hydromorphone contre
Background
Hyponatremia is defined as a serum sodium (Na) of less than 136 mmol/L. Symptoms from hyponatremia include headache, nausea, vomiting, and confusion; however, severe hyponatremia (Na < 120 mmol/L) can result in seizures, coma, and death. There are multiple etiologies of hypotonic hyponatremia (Table 1) with medications being a frequent contributing factor (Table 2).

There are case reports of patients developing hyponatremia while on opiates (Table 3) which are thought to increase antidiuretic hormone (ADH) secretion. We report a case of severe hyponatremia in a woman with central diabetes insipidus (DI) treated with desmopressin while receiving large doses of hydromorphone, which suggests that opiates’ effects on water balance may not be centrally mediated.

Case Report
A 55-year-old woman with central DI secondary to resection of a non-functioning pituitary macroadenoma presented to the hospital with an asthma exacerbation. She also had central adrenal insufficiency and hypothyroidism. Her medications on admission were desmopressin 0.8 mg PO TID, prednisone 10 mg PO qAM and 7.5 mg PO qPM, levothyroxine 0.1 mg PO daily, diclofenac/misoprostol 75/0.2 mg PO BID, rabeprazole 20 mg PO daily, domperidone 10 mg PO QID and salbutamol, ipratropium and budesonide/formoterol inhalers. She was admitted and treated with bronchodilators and high-dose corticosteroids. Her serum sodium on admission was 124 mmol/L. This was thought to be due to excessive desmopressin, which was confirmed by serum and urine osmolality measurements (267 mOsmol/kg and

Table 1: Etiologies of hypotonic hyponatremia (modified from Adrogue et al. 2000 and Halperin et al. 1999)

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Description</th>
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<tbody>
<tr>
<td>Excessive water intake or inappropriately low solute intake</td>
<td>Psychogenic polydipsia, beer potomania, “tea-and-toasters”</td>
</tr>
<tr>
<td>Hemodynamically mediated secretion of ADH</td>
<td>Hypovolemia&lt;br&gt;Decreased intravascular volume - Congestive heart failure, cirrhosis, renal failure&lt;br&gt;Third spacing – bowel obstruction, peritonitis, pancreatitis</td>
</tr>
<tr>
<td>Excessive loss of solutes</td>
<td>Renal losses - Diuretics, adrenal insufficiency, osmotic diuresis&lt;br&gt;Extrarenal losses – vomiting, diarrhea, blood loss, excessive sweating</td>
</tr>
<tr>
<td>Inappropriate secretion of ADH (SIADH)</td>
<td>Malignancy – pulmonary tumours, mediastinal tumours&lt;br&gt;CNS disorders – stroke, hemorrhage, mass lesions, trauma, demyelinating disorders&lt;br&gt;Non-malignant pulmonary conditions – acute respiratory failure, infections, positive pressure ventilation&lt;br&gt;Drugs – refer to Table 2&lt;br&gt;Other – postoperative state, pain, nausea, HIV infection</td>
</tr>
</tbody>
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Hyponatremia in a Patient with Central Diabetes Insipidus

Table 2: Examples of medications causing hyponatremia (modified from Adroque et al. 2000 and Halperin et al. 1999)\(^1,3\)

<table>
<thead>
<tr>
<th>Affecting sodium and water homeostasis</th>
<th>Affecting water homeostasis</th>
</tr>
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<tbody>
<tr>
<td>Thiazides, indapamide, amiloride, loop diuretics</td>
<td>Antidepressants (tricyclic antidepressants, SSRIs, monoamine oxidase inhibitors), antipsychotics (phenothiazines, haloperidol), antiepileptics (carbamazepine, oxcarbazepine, valproic acid), anti-neoplastic agents (platinum based, vinca alkaloids, cyclophosphamide), opiates</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Potentiation of ADH effect</th>
<th>Reset osmostat</th>
</tr>
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<tbody>
<tr>
<td>NSAIDs, antiepileptics (carbamazepine, lamotrigine), cyclophosphamide, desmopressin</td>
<td>Venlafaxine, carbamazepine</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Rare causes (case reports)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACE inhibitors, amlodipine, IVIG, ecstasy, sulfa, ciprofloxacin, rifabutin, amiodarone, propafenone, proton pump inhibitors, bromocriptine, bupropion</td>
</tr>
</tbody>
</table>

Table 3: Opiate-induced SIADH - Case reports\(^4-7\)

<table>
<thead>
<tr>
<th>Case</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>43 year old woman</td>
<td>A pulmonary neuroblastoma admitted with pain crisis from spinal metastases, on hydromorphone. Developed SIADH and hyponatremia (Na 119 mmol/L) with seizures two days after hydromorphone was exchanged for a fentanyl patch. The hyponatremia resolved with fluid restriction and discontinuation of fentanyl patch.</td>
</tr>
<tr>
<td>79 year old woman</td>
<td>Admitted for elective knee replacement surgery, started on acetaminophen and tramadol postoperatively for pain management. Developed SIADH and hyponatremia (Na 111 mmol/L) with confusion and seizures on postoperative day #2. Hyponatremia resolved with fluid restriction, 3% saline and discontinuation of tramadol.</td>
</tr>
<tr>
<td>92 year old woman</td>
<td>Started on tramadol for pain control in hospital. Developed SIADH and hyponatremia (Na 117 mmol/L) three days after starting tramadol. Hyponatremia resolved with fluid restriction and discontinuation of tramadol.</td>
</tr>
<tr>
<td>56 year old man</td>
<td>Admitted to hospital with intentional mixed acetaminophen, codeine and tramadol overdose. Developed hyponatremia (Na 119 mmol/L) and confusion on day 2 of admission. Mental status improved with fluid restriction, but patient signed out against medical advice before further studies could be completed.</td>
</tr>
</tbody>
</table>

734 mOsmol/kg, respectively). Her desmopressin dose was decreased to 0.6 mg PO BID and her serum sodium normalized.

Her hospitalization was complicated by diverticulitis with an intra-abdominal abscess 3 weeks after admission. She was treated with antibiotics, stress dose corticosteroids and percutaneous drainage of the abscess. Hydromorphone was ordered on an as needed basis for analgesia. She became moderately hyponatremic (Na = 129 mmol/L), necessitating a reduction in her desmopressin to 0.4 mg PO BID. Five weeks after her admission, she developed acute abdominal pain with hemodynamic instability. A CT scan revealed perforation of a jejunal diverticulum requiring a laparotomy with a bowel diversion and drainage of intra-abdominal abscesses. She required a vasopressin infusion at 1 unit/hr for hypotension. Hydrocortisone 100 mg IV q8h was also started. She was nil per os (NPO) postoperatively, and her oral desmopressin was held. Her sodium on the vasopressin infusion was 145 mmol/L. Once she stabilized, vasopressin was discontinued and intranasal desmopressin was initiated.

Despite a rapid increase in the intranasal desmopressin to 10 µg every 4 hours, she developed polyuria and her serum sodium rose to 154 mmol/L, requiring a D5W infusion and re-initiation of vasopressin. She resumed oral desmopressin (0.8 mg PO BID) 5 days later after her sodium corrected. Hydrocortisone was weaned and she was restarted on prednisone 7.5 mg PO daily seven days after her laparotomy. She was transferred to the ward 9 days after surgery on a 2/3 D5W and 1/3 normal saline infusion at 75 mL/h. She was given regular doses of long acting hydromorphone along with subcutaneous doses PRN. Her total daily doses of hydromorphone are detailed in (Figure 1).

Her sodium was 133 mmol/L upon transfer to the ward and continued to decrease despite reducing the dose of oral desmopressin (Figure 1). Her prednisone was increased to her preadmission dose of 10 mg PO qAM and 7.5 mg PO qPM. At this time, there was suspicion that her hyponatremia was related to her hydromorphone. Her intravenous fluids were
Figure 1: Patient’s serum sodium levels, total daily hydromorphone and desmopressin doses during her hospitalization.

Total daily doses of hydromorphone were calculated as PO equivalency using a ratio of 1:2 (IV/SQ:PO).
changed to normal saline at 75 mL/h, her desmopressin dose was rapidly titrated down, and a suggestion was given to hold the prn hydromorphone. However, she continued to receive regular and prn doses of hydromorphone for pain, and her sodium reached a nadir of 119 mmol/L even after her desmopressin was held. At this time, her serum osmolality was 243 mOSmol/kg and her urine osmolality was 408 mOSmol/kg, suggestive of excessive ADH. Her hydromorphone and normal saline infusion were discontinued, and she was transferred back to the intensive care unit. She was fluid restricted to 500 mL/day and her desmopressin remained on hold. A 3% saline infusion was given at 10-20 mL/h for 7 hours until her sodium rose to 122 mmol/L, after which a vasopressin infusion at 1.0-1.5 U/hr was started for controlled correction of sodium over the next 24 hours. She was subsequently restarted on oral desmopressin. Two days later, her sodium was 136 mmol/L on desmopressin 0.8 mg PO BID with no intravenous fluids. Her serum sodium was stable for the remainder of her hospitalization. She was discharged home on desmopressin 0.7 mg PO BID with a serum sodium of 141 mmol/L.

Discussion

Upon presentation to the hospital, this patient’s initial episode of hyponatremia was likely related to excessive desmopressin dose. Her episode of severe hyponatremia occurred approximately 10 days after her laparotomy for intestinal perforation (Day 51 of admission). During the patient’s initial episode of hyponatremia, she was on several medications that could have contributed to hyponatremia (Table 2), including diclofenac/misoprostol and rabeprazole.9 Diclofenac/misoprostol was discontinued on Day 21 of admission, almost 1 month prior to the laparotomy. Rabeprazole was changed to pantoprazole shortly after admission, and since her dose was stable throughout her hospitalization, it is unlikely that this contributed to the subsequent severe hyponatremia.

Corticosteroids have been shown to inhibit an inducible cyclooxygenase in mice, which inhibits prostaglandin synthesis.10 Prostaglandins enhance both sodium and water excretion at the level of the kidney; therefore, inhibition of prostaglandins can lead to increased water retention and hyponatremia.11 NSAIDs, which inhibit prostaglandins, have been shown to induce hyponatremia in case reports independently12 and in combination with desmopressin,13 so it is possible that corticosteroids could contribute to hyponatremia by decreasing prostaglandin levels. However, our patient’s prednisone was either at the maintenance dose or lower during her severe episode of hyponatremia, and previous larger increases in her corticosteroids did not cause hyponatremia. We therefore concluded that corticosteroids were unlikely to have contributed to her severe hyponatremia.

During her severe episode of hyponatremia, urine and serum osmolality were suggestive of excessive ADH. New medications at the time of the severe hyponatremia included piperacillin/tazobactam, amlodipine, atorvastatin, intravenous heparin, and oral hydromorphone. Hydromorphone had been initiated several weeks prior to her laparotomy, and she became moderately hyponatremic requiring a decrease in her desmopressin dose. After her laparotomy, she received large daily doses of hydromorphone, and despite significant reductions in the desmopressin, she became severely hyponatremic. Since none of the other medications she was taking after her laparotomy had a temporal relationship with her hyponatremia, the most probable culprit medication to trigger the severe hyponatremia was hydromorphone.

Opiates have been theorized to cause ADH related antidiuresis for over 40 years. In 1968, a study on rats demonstrated that morphine produced a dose-response related decrease in urine flow.14 However, other animal-based studies have shown that chronic exposure to morphine actually caused increased urine output in rats.15 In humans, a fentanyl infusion in healthy male volunteers was shown to increase plasma ADH concentrations, but there were no urine volume or sodium measurements in the participants, and it is difficult to extrapolate if this could cause significant hyponatremia.16 A review article by Sezen (2003) reported that administration of a mu opioid agonist caused antidiuresis in some experimental conditions and diuresis under other conditions.17 Administration of kappa or delta opioid agonists appeared to cause a diuretic effect.17 An extensive review article by Vuong et al (2010) summarized that opiates can either stimulate or suppress endogenous ADH secretion, and these effects may be related to the fluid status of the subject.8 The theorized mechanism was that endogenous opioids act directly on the neurohypophysis to influence ADH secretion, likely mediated by mu and kappa opioid receptors.8

However, when rats congenitally lacking ADH were injected with morphine, they had decreased urine output, which suggests that morphine has an antidiuretic effect that is not ADH mediated.18 These mechanisms of action of opiates are unknown, but may involve opioid receptors in the kidney. When Kapusta et al (1991) infused a mu opioid receptor agonist directly into the left kidney of anesthetized rats, it resulted in decreased urinary flow rate and decreased sodium excretion from the left kidney compared to the right.19 It was hypothesized that this was due to the effects of the mu opioid receptor agonist on the renal sympathetic nerves. However,
a similar study by the same group using a different opioid agonist had shown that the antidiuretic effect of opioid agonists was independent of the renal sympathetic nervous system. Although the exact mechanisms of the antidiuretic effects of opiates have not been established, they likely involve both central and peripheral mechanisms.

Conclusion
This is a case report of opiates interacting with synthetic ADH to cause hyponatremia. At this time, mechanisms of this interaction remain unclear, but in this case of a woman with central DI, the effects of hydromorphone are likely mediated by a mechanism independent of central secretion of ADH. Given the potential consequences of severe hyponatremia, physicians need to be aware of this interaction between opiates and desmopressin.

Competing Interests
Authors GM, OS and AP have nothing to declare. Author NM has received research funding from Merck and AstraZeneca.

References

Message du rédacteur en chef (suite de la page 5)

Par conséquent, si l’on se doit d’agir en réaction à des articles comme celui d’Allen et coll., on devrait surtout veiller à enseigner aux étudiants en médecine et aux médecins résidents à mieux comprendre la façon d’interpréter l’ensemble des paramètres et des termes qu’ils rencontreront dans la documentation médicale ou au fil de présentations offertes lors de congrès ou de tables-rondes. Pour réussir, les apprenants/médecins dont la formation se poursuit tout au long de la vie devront améliorer leurs compétences en interprétation des données, en même temps qu’ils veillent à maintenir leurs connaissances à jour.

Mitch Levine
Considering Values and Contexts in Clinical Practice Guidelines: Are We Becoming More Person-Centred?

Benjamin Chin-Yee, BSc MA, Lisa Richardson MD MA FCRPC

Abstract
Clinical practice guidelines (CPGs) have become ubiquitous in medicine, created to promote rational and standardized clinical decision-making. CPGs are often criticized for overlooking patient values and contexts, which many argue deserve a more explicit place in recommendations. This article explores the role of patient values and contexts in CPGs based on a critical discourse analysis of Canadian Diabetes Association (CDA) Guidelines from 1992-2013. We highlight emerging discourses related to person-centred care in CDA guidelines during this period, which support an increasing emphasis on collaboration and shared decision-making, as well as consideration of patient values and contexts. We discuss possible reasons for this shift and the implications for practitioners. Despite this encouraging trend, our analysis also suggests areas for improvement, particularly concerning the integration of patient preferences in clinical decision making and research.

Résumé
Clinical practice guidelines (CPGs) have become ubiquitous in medicine, created to encourage rational and standardized clinical decision making. The current emphasis on CPGs grows out of a longer history of regulation and standardization in healthcare during the 20th Century, reinvigorated more recently by the Evidence-Based Medicine (EBM) movement. The EBM movement promotes at its core “practice guidelines based on rigorous methodological review of the available evidence.” Since its inception, EBM has faced criticisms regarding what some consider its overzealous and often indiscriminate application of evidence-based guidelines. Several authors raise concerns about the applicability of CPGs for large patient populations, particularly the elderly with multiple comorbidities who are most often excluded from clinical trials. CPGs are also criticized for being too directive and overlooking important considerations such as patient values and contexts, which many argue deserve a more explicit place in recommendations.

Proponents of EBM have acknowledged the tension between providing individualized care and promoting best practices based on high quality medical literature. Recently, Greenhalgh et al. wrote of a ‘crisis’ in EBM, listing several problems facing the movement such as difficulties applying CPGs to patients with multiple medical conditions and the loss of person-centred care that may result from the rigid application of CPGs. The group called for a ‘renaissance’ in EBM, recommending a renewed focus on individualized care and shared decision making.

Despite the identified need, integrating patient values and contexts into evidence-based CPGs remains problematic. Research suggests CPGs poorly incorporate patient preferences, although there may be a recent trend towards increasing consideration of preference evidence. Some critics contend that CPGs engender rigid standardization that is inherently in conflict with flexible, contextual clinical judgement. Others argue that creating a space for patient values requires a more pluralistic concept of evidence within EBM. Sociological research examining EBM knowledge production shows how evidence-based CPGs often implicitly incorporate extra-evidentiary factors—such as pragmatic, political, and ethical considerations—into their recommendations. Patient preferences may play a role in shaping CPGs, supported by new initiatives to directly involve patients and the public in guideline development. Indeed, the evolution of CPGs over the past two decades suggests that patient values and contexts received increased attention in recent recommendations. Here, we highlight examples of emerging person-centred discourses in one prominent CPG, the Canadian Diabetes Association (CDA) guidelines, and discuss the implications for practitioners.

**Emerging Person-Centred Discourses in Canadian Diabetes Guidelines**

The CDA guidelines, issued every five years since 1992, are among the longest standing evidence-based diabetes CPGs, internationally-recognized for their quality and rigour. We conducted a critical discourse analysis of CDA guidelines from 1992-2013 to examine discourses related to patient values and contexts. Critical discourse methodology analyzes language for what it reveals about knowledge, power relations, and social practices. We identified three emerging discourses related to person-centred care in CDA guidelines during this period, which support an increasing emphasis on collaboration and shared decision making, as well as consideration of patient values and contexts.

**Discourses of collaboration**

The most evident shift in CDA guidelines from 1992-2013 is a major focus on collaboration between practitioners, patients, and families, which has replaced the more prescriptive language of earlier iterations. Earlier guidelines discuss patient education and ‘self-care’ as a way to motivate patients to meet CPG targets, rather than as a means to engage with patients to foster mutual understanding. In the 1992 and 1998 CPGs, patient involvement is framed in terms of a “rights and responsibilities” discourse. Patients have the right to be “fully informed and involved in their treatment,” which amounts to receiving “sufficient, appropriate information about their condition and its complications to enable them to grant informed consent to the treatment prescribed.” These rights also are accompanied by patients’ responsibility to “cooperate and communicate openly and honestly” with healthcare professionals.

The greatest change occurs from 2003 to 2008, with the inclusion of an additional chapter on “Self-management Education,” which goes “beyond a focus on adherence to guidelines and treatment prescriptions” to incorporate “non-didactic (e.g. active, participatory) education.”

Patient education is no longer viewed as the unidirectional dissemination of knowledge to ensure adherence, but rather emphasizes interventions to facilitate “participation,” “alliance” and “partnership” between patients and healthcare providers. Responsibility is shifted to providers, who must demonstrate “acceptance (respect) for the individual’s perspectives.”

Collaborative discourses are not only apparent in recommendations about patient education, but also in
guidance to practitioners about their utilization of the CPGs. The 1998 CPGs state that primary care physicians have an “obligation to incorporate and evaluate clinical practice guidelines,” a strong mandate that places the onus squarely on the provider. In 2003, this “obligation” becomes distributed among the interdisciplinary diabetes healthcare team, and by 2008 it is replaced by less prescriptive language. The 2008 CPGs recommend that diabetes care should be “community-based, culturally and socially appropriate, and respectful of age, gender and socioeconomic conditions.”

Discourses of context
Updated CDA guidelines also demonstrate increasing consideration of patients’ sociocultural contexts. This development is best illustrated by the creation of recommendations for specific populations, especially Aboriginal peoples. Early CPGs vaguely allude to the unique challenges faced by Canada’s First Nations, Inuit and Métis populations. Although they suggest that healthcare practitioners incorporate “traditional values and customs into the overall treatment approach,” they do not offer explicit, actionable strategies for how to achieve this goal. As of 2013, CPGs highlight the importance of patient contexts in diabetes care.

The 2013 guidelines are the first CPGs to acknowledge how “historic-political and psychosocial factors, stemming from a history of colonization that severely undermined Aboriginal values, culture, and spiritual practices,” contribute to higher rates of diabetes and worse outcomes.

The updated CPGs offer more specific approaches for prevention, screening and management, and encourage attention to contextual factors such as food security and community infrastructure. In contrast to the 1992 CPGs, which conceded that addressing sociocultural barriers “may well be beyond the scope of the average medical practitioner,” the 2013 CPGs shares recommendations for “System Interventions,” such as the inclusion of Aboriginal health workers in multidisciplinary teams, to improve the provision of care.

Discourse of values and preferences
New to the 2003 CDA guidelines was the disclaimer that: “Healthcare professionals must consider the needs, values and preferences of individual patients,” a statement re-iterated in 2008 and 2013. The 2013 CPGs further recognize that “patient preferences are not always included in clinical research, and, therefore, patient values and preferences must be incorporated into clinical decision-making.”

Although these most recent CPGs encourage practitioners to consider the perspectives and wishes of patients, they offer no guidance about how such factors should be incorporated into practice. Determining how patient preferences should influence choices such as dietary or pharmacologic interventions is left to the discretion of individual practitioners. Thus, while this emerging discourse underscores the importance of patient values in clinical decision making, its integration with other evidence-based recommendations remains incomplete.

Discussion
Our analysis of CDA guidelines from 1992-2013 revealed three emerging discourses, which suggest an increasing emphasis on collaboration, patient values and contexts in diabetes care. These changes may result from the inclusion of patient representatives in CDA guideline development in 2013, which reflects a rise in increasingly informed healthcare consumers—so-called ‘expert patients’—striving for greater control over their medical care.

Other conditions that contributed to this shift include the growing research on the importance of individualized care and patient empowerment in the management of chronic diseases. Taken together, these evolving discourses may herald a greater focus on shared decision making and person-centred care within EBM.

Despite the shift towards person-centered care, CPGs remain imperfect. Our analysis suggests some areas for improvement. The person-centred discourses identified could benefit from further elaboration, particularly concerning the integration of patient preferences in clinical decision-making. Although the language of recent CPGs is less directive, it remains unclear how practitioners should weigh patient values, especially if a patient’s preferences conflict with recommendations. Clearly, the healthcare provider must maintain an open mind, and use clinical judgement to balance patient preferences with evidence-based recommendations; however, current CPGs offer little guidance on how this is best accomplished, stressing the continued need to educate practitioners in skills of practical reasoning. Moreover, recognition that “patient preferences are not always included in clinical research” should encourage research methodologies that better integrate patient values, such as collaborative inquiry or participatory action models.

Lastly, one must be cognizant of the ‘gap’ that exists between CPG recommendations and their application by practitioners; whether or not these emerging discourses have a tangible impact on the delivery of care remains an open question requiring further study. Nonetheless, the emerging person-centred discourses identified here suggest a
potential shift, which we hope marks a genuine trend towards more reflective CPGs within a more nuanced and inclusive understanding of EBM.

Author contributions
*Both BCY and LR were involved in the conception and design of this project, and the analysis and interpretation of data. BCY prepared the initial draft of the manuscript with input from LR. Both authors reviewed and approved the final draft for publication.

References
Graft Versus Host Disease

Janeve Desy, MD and Marc Deschenes, MD

Abstract

Graft Versus Host Disease (GVHD) is a rare complication of liver transplantation with a mortality rate exceeding 65%. A 53-year-old male presented with a diffuse maculopapular rash, diarrhea, lymphopenia, fever, and confusion 14 days after orthotopic liver transplantation for hepatitis B cirrhosis. Skin biopsy and HLA-typing of peripheral blood confirmed a diagnosis of solid organ transplant-related GVHD. This report summarizes what is known about this disease and emphasizes the importance of early diagnosis, which is one of the only factors known to improve the mortality of this deadly condition.

Résumé

La réaction du greffon contre l’hôte (Graft Versus Host Disease ou GvHD) est une complication plutôt rare de la greffe du foie. Le taux de mortalité lié à cette affection dépasse les 65 %. Nous décrivons ici le cas d’un homme de 53 ans qui, 14 jours après avoir subi une greffe hépatique orthotopique pour une cirrhose due à l’hépatite B, présente une éruption maculopapuleuse diffuse, de la diarrhée, une lymphopénie, de la fièvre et de la confusion. Une biopsie cutanée et le typage-HLA du sang périphérique ont confirmé un diagnostic de réaction du greffon contre l’hôte consécutive à la greffe d’un organe solide. Ce rapport fait un résumé de ce que l’on connait de cette maladie mortelle et met l’accent sur l’importance d’un diagnostic précoce, qui est l’un des seuls facteurs connus pouvant améliorer l’issue de cette condition mortelle.
Case Presentation

A 53-year-old previously healthy male underwent orthotopic liver transplantation for hepatitis B cirrhosis. At the time of transplantation, he had a Model for End stage Liver Disease (MELD) score of 22.

The surgery was uneventful and his postoperative course was unremarkable. The patient was transferred out of the Intensive Care Unit without issue. The Immunosuppressive regimen consisted of one dose of antithymocyte globulin (ATG), two doses of the monoclonal antibody basiliximab, as well as daily methylprednisolone, mycophenolate mofetil (MMF), and tacrolimus.

On Post-Operative Day (POD) 10, the patient developed confusion and asterixis, and was treated with Lactulose for presumed hepatic encephalopathy. On POD 14, the patient’s lymphocyte count decreased, and prednisone and MMF doses were reduced. On POD 16, the patient developed right-sided abdominal pain, diffuse watery diarrhea, and a headache. Prednisone and MMF doses were decreased further. On POD 18 the patient developed a rapidly progressive diffuse maculopapular rash involving the trunk, and extremities (Figure 1). Given that a drug reaction was considered as a possible etiology of this rash, Septra and Valgancyclovir were discontinued. One day later, the patient developed a fever of 38.6°C and was started empirically on piperacillin-tazobactam.

The patient then developed progressive confusion, tachypnea (respiratory rate 28 breaths per minute), tachycardia (heart rate 116 beats per minute), hypotension (BP 77/47 mmHg), and worsening confusion. On POD 23, the patient was admitted to the Intensive Care Unit (ICU).

Initial investigations in the ICU showed hemoglobin 91 g/L, platelet count 32 x 10^9/L, white blood cell (WBC) count 0.59 x 10^9/L (neutrophils 0.49 x 10^9/L), creatinine 76 µmol/L, ALT 15 U/L, ALP 53 U/L, conjugated bilirubin 11 µmol/L, INR 1.09, and Albumin 19 g/L. Computed tomography showed moderate airspace disease in the lower lobes of the lungs bilaterally and diffuse dilatation of the small and large bowel.

The patient was volume resuscitated, intubated for respiratory distress, and Piperacillin-Tazobactam was replaced by Imipenem and Vancomycin. In addition, stress doses of steroids were given. Differential diagnosis at this time included acute Graft Versus Host Disease (GVHD), Toxic Epidermal Necrolysis (TEN), viral infection such as Cytomegalovirus (CMV), organ rejection, sepsis, or adrenal insufficiency.

Further investigations demonstrated negative CMV IgM and PCR, negative Parvovirus B19 IgG and IgM, a random cortisol level of 487 mmol/L, and negative stool cultures. Blood and sputum cultures were positive for Vancomycin Resistant Enterococcus (VRE) and skin biopsy revealed acute interface dermatitis, vacuolar type, with necrotic keratinocytes and no evidence of eosinophils, which was most suspicious of acute GVHD. Human Leukocyte Antigen (HLA) typing of peripheral blood and the patient’s oral cavity demonstrated 85% donor lymphocytes, confirming this diagnosis.

Discussion

This case presentation describes a typical presentation of an uncommon disease. Although GVHD is a common occurrence following Hematopoietic Stem Cell Transplantation (HSCT), it is a rare complication after solid organ transplantation, with an incidence of 1-2%.1

Billingham et al. first described the prerequisites needed for the development of GVHD from any cause in 1966.2 First, a source of immunocompetent lymphocytes must be introduced into a host. It has been demonstrated that between 10^7 to 10^8 donor lymphocytes are stored in the portal tract and parenchyma of transplanted livers.3 Next, there must be differences between the histocompatibility antigens of donor lymphocytes and host cells which occurs following liver transplantation because, unlike in the HSCT population, recipients of organ transplantation are not Human Leukocyte Antigen (HLA) matched with the donor organ. Lastly, the host must be unable to reject the HLA unmatched donor
lymphocytes, which occurs following liver transplantation due to the multiple immunosuppressive medications used to prevent rejection.

Much like in the HSCT population, GVHD following liver transplantation is characterized by a maculopapular rash involving the palms and soles (94.2%), fever (66.6%), diarrhea (54%), and pancytopenia (54%)\(^4\) (Table 2). It usually occurs between 2 to 8 weeks post operatively.\(^3\) However, unlike in the HSCT population, liver transplant related GVHD typically does not affect the liver because graft lymphocytes actually originated from this organ, making it an immune-tolerated site.\(^6\)

A skin biopsy that demonstrates epidermal dyskeratosis and epithelial cell necrosis is very suggestive of GVHD but is not diagnostic.\(^7\) To confirm a diagnosis in solid organ transplant associated GVHD, chimerism, the presence of donor cells in the host’s blood or tissues, must be demonstrated.\(^8\)

A large retrospective study published in 2007 by Chan et al. looked at 205 patients from a large database who had received a liver transplantation and compared those patients who developed GVHD (1.9%) with those who did not.\(^9\) Although the number of GVHD cases was very small,\(^4\) the authors identified that patients with autoimmune hepatitis (AIH), alcoholic liver disease (ALD), and hepatocellular carcinoma (HCC) were significantly more likely to develop GVHD (with an incidence of GVHD in these populations of 16%, 5.6% and 7.1% respectively). In addition, patients with GVHD were significantly more likely to have diabetes mellitus (DM) than those patients who did not develop the disease (\(p=0.02\)). These authors suggest that because DM, AIH, and HCC are immunodeficient states, patients with these conditions are more likely to fail to destroy donor lymphocytes introduced during liver transplantation.

Another retrospective study published in 2005 by Kamei et al. determined the degree of mismatch at the HLA –A, -B, and –DR loci between the donors and recipients of all of liver transplants performed in Japan.\(^10\) They identified 906 pairs of patients, 8 of whom developed GVHD. They found that all patients that developed GVHD had one-way donor-dominant HLA matching at all three of these alleles. This means that at all 3 loci, the recipient was heterozygous and the donor was homozygous for an identical allele. This combination is thought to contribute to the development of GVHD because it renders the recipient unable to recognize the donor lymphocytes as foreign early after transplantation. Donor lymphocytes are then able to proliferate, undetected by the host’s immune system and attack host tissues.

Unfortunately, although multiple treatment modalities have been attempted, the mortality rate of GVHD following liver transplantation exceeds 65%.\(^4\) Multiple approaches, including decreasing immunosuppressive therapy to enable the host immune system to kill the donor lymphocytes, as well as increasing immunosuppression to suppress the damaging activities of activated donor lymphocytes have been tried with little success. Unfortunately, no individual medication or combination of medications has proven effective at altering the mortality rate of this disease.\(^4\) Commonly used approaches include the use of corticosteroids, the anti T cell antibodies ATG and alemtuzumab (Campath), the cytokine inhibitors infliximab and entanercept, immunoglobulins, antimetabolites such as azathioprine, and alkylating agents such as cyclophosphamide.\(^5\)

A recent review article by Akbulut et al. analyzed all 87 case reports of GVHD after liver transplantation in the literature and determined that factors that are significantly associated
with higher mortality include the presence of pancytopenia, diarrhea, a larger age difference between the recipient and donor, and an increased time from symptom onset to diagnosis and treatment. Further research into the possible risk factors of this condition may help to decrease the incidence of this disease. Interventions that may reduce the development of GVHD after liver transplantation include avoiding one-way donor-dominant HLA mismatch and treating the liver specimen with anti-lymphocyte preparations prior to transplant in patients with certain etiologies of liver disease, such as AIH, ALD, and HCC. To date, there has been no clear pattern of success in regards to choosing a treatment modality, and this will be an area of active research in the future.

In the case of the patient described here, after acute transplant-related GVHD was confirmed with HLA typing of peripheral blood, the patient was treated with high doses of corticosteroids and the anti T cell antibodies ATG and Alemtuzumab. After discontinuation of tacrolimus, cyclosporine was continued throughout this treatment regimen.

Unfortunately, the patient developed progressive multi-organ dysfunction and passed away of sepsis and invasive aspergillus on POD 45.

Although GVHD is a rare complication after liver transplantation, physicians should recognize the classical presenting symptoms and signs of this disease, which include diarrhea, confusion, a maculopapular rash involving the palms and soles, pancytopenia and the absence of liver enzyme elevations. Due to the non-specific nature of these presenting features, it is important to consider GVHD early on in transplant patients presenting with some or all of these symptoms. Although multiple treatment regimens have been tried, due to the complicated interactions between the host and donor immune systems, there is currently no known effective treatment for this disease and the mortality rate continues to exceed 65%. Early diagnosis is crucial as this is one of the only factors known to significantly improve the mortality of this deadly condition.

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* The author guarantor of this case report is Janeve Desy. Janeve Desy performed the literature review and wrote the first draft of the paper. Marc Deschenes critically reviewed the paper. There was no financial support for this manuscript. There are no potential financial or other conflicts of interest. Marc Deschenes serves on the advisory board for Merck, Gilead, Abbvie, Lupin, Riche, and Bristol-Myers Squibb.
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Cushing’s, Dilated Cardiomyopathy and Stroke: Case Report and Literature Review

Aashna Gill MBBS, Naeem Dean M.B.B.S, Rany Al-Agha MD

Abstract
Dilated cardiomyopathy (DC) is a rare complication of Cushing’s syndrome. Hypertension and coronary artery disease tend to persist even after treatment of source of hypercortisolism as evidenced by previous studies. Based on a few case reports, Dilated Cardiomyopathy appears to be completely reversible with treatment of Cushing’s. We suggest that, in patients with idiopathic dilated cardiomyopathy, Cushing’s syndrome should be considered in the differential diagnosis. In patients with clinical features of Cushing’s, appropriate screening tests for Cushing’s should be carried out, which are inexpensive, non-invasive and readily available.

Résumé
La myocardiopathie dilatée est une complication rare du syndrome de Cushing. Comme le démontrent les recherches antérieures, l’hypertension et la coronaropathie tendent à persister même après un traitement visant l’origine de l’hypercortisolémie. Or, plusieurs observations cliniques semblent indiquer que la myocardiopathie dilatée serait complètement réversible lorsqu’on traite un syndrome de Cushing. Nous proposons que le syndrome de Cushing soit un diagnostic différentiel envisagé chez les patients présentant une myocardiopathie dilatée idiopathique. Chez les patients présentant des caractéristiques cliniques du syndrome de Cushing, des tests de dépistage appropriés devraient être effectués, d’autant plus que ces tests sont peu coûteux, non effractifs et facilement disponibles.
Case Report

A 29-year-old male was admitted in our hospital under the cardiology service for a trans-esophageal echocardiogram after having a left middle cerebral artery stroke resulting in aphasia and mild right sided weakness. CT and MRI scan of the head showed findings consistent with a left sided infarct (Figure 1). A transthoracic echocardiogram performed after the stroke was consistent with dilated cardiomyopathy with ejection fraction of 25% (Figure 2) One year prior to the current admission he was diagnosed with diabetes and hypertension. Other issues included obesity of rapid onset, and dyslipidemia.

In view of a suspected cardioembolic stroke, the patient was anticoagulated with warfarin. Cardiac monitoring on the ward and a subsequent 48 hour holter monitor did not show any evidence of atrial fibrillation. He was also given appropriate therapy for congestive heart failure. The endocrinology service was consulted for management of diabetes. Findings upon physical examination were consistent with possible Cushing’s Syndrome (Figure 4,5). Further investigations showed a 24 hour urine cortisol level of 702 nmol (normal <230 nmol/L); am cortisol after 1mg dexamethasone suppression was 748 nmol/l (normal <50 nmol/l), ACTH<5ng/l(normal 10-80 ng/l), Salivary cortisol 11 pm -30.4 nmol/l (normal <2.8 nmol/l). CT Adrenal glands showed a large left adrenal mass consistent with an adenoma (Figure 3). Subsequently, the patient underwent unilateral adrenalectomy. Cortisol replacement was started to avoid adrenal crisis due to suppression of the contralateral adrenal gland. The patient was discharged home, and follow up was arranged in the Endocrinology and Stroke Prevention Clinic.

Over the next few months the patient was followed up in the stroke rehabilitation clinic resulting in marked improvement in speech and right sided weakness. A subsequent transthoracic echocardiogram after 5 months showed normal size of left ventricle and an ejection fraction of 50-55% (Figure 4). Warfarin was discontinued and the patient was started on aspirin. There was gradual improvement in his glycemic control with normalization of hbA1c in 5 months. Therapy for diabetes was discontinued. Features of Cushing’s including red striae and obesity continue to improve.
Cushing’s, Dilated Cardiomyopathy and Stroke

Discussion

Endogenous CS is a rare condition with approximated incidence of 2-3/million.\(^1\) Exogenous/Iatrogenic Cushing’s is presumed to be more common than endogenous Cushing’s. Increased Cardiovascular Risk related to CS is an established entity. Patients with CS have increased cardiovascular morbidity.\(^2\) Various studies indicate that cardiovascular risk remains elevated even after treatment of Cushing’s.\(^4\) In contrast to hypertension and coronary artery disease, which are known to be more prevalent and tend to persist even after treatment of Cushing’s syndrome, DC is a rare complication which appears to have a favorable outcome with treatment of Cushing’s syndrome.

DC is a rare but significant complication of CS. DC is a potentially curable complication, after treatment of Cushing’s.

Patients with CS have twice the mortality rate compared to controls. Studies have shown that Pptients with CS are at increased risk for venous thromboembolism, myocardial infarction, stroke, peptic ulcers, fractures, and infections.\(^2\) Patients on exogenous steroids who have iatrogenic Cushing’s have also been shown to have increased cardiovascular events including coronary artery disease, heart failure and ischemic stroke.\(^4\) Steroids are also known to increase the risk of thrombosis.\(^3\)

Endogenous causes of CS include ACTH dependent Cushing’s syndrome (80%) and ACTH independent Cushing’s syndrome (20%). ACTH dependent CS includes Cushing’s disease (68%), ectopic ACTH (12%) and ectopic CRH (<1%). ACTH independent causes include: adrenal adenoma (10%) adrenal carcinoma (8%) micro and macro nodular hyperplasia (<1%).

The cardiovascular complications from CS have been mainly attributed to hypertension and include left ventricular hypertrophy, diastolic heart failure, and myocardial ischemia. Isolated DC due to CS in the absence of other cardiovascular complications is rare, and is potentially completely curable with treatment of Cushing’s.

Studies specifically looking at the persistence of cardiovascular morbidity after treatment of Cushing’s have shown that patients fully treated and achieving normal serum and urinary cortisol levels for at least 5 years have an increased prevalence of atherosclerosis and obesity, hypertension, impairment of glucose tolerance, hyperlipidemia, and hypercoagulability.\(^3\)

DC is a rare complication of Cushing’s with less than 10 cases reported so far.\(^7-14\) Although the exact mechanism is unknown, it is likely secondary to hypercortisolism induced myopathy of the cardiac muscle, independent of the effects of cortisol on vasculature.\(^6\) The reversal of Cardiomyopathy after treatment of hypercortisolism is likely similar to improvement in proximal myopathy after treatment. This reversibility makes DC a unique complication in Cushing’s syndrome patients.

In some reported cases, patients identified later with CS were diagnosed previously as idiopathic DC. In 1 case, the adrenal adenomas had been found incidentally as part of heart transplant work up for DC.

These cases indicate that there is a possibility that Cushing’s syndrome as a cause of dilated cardiomyopathy is under estimated. Also, given the prevalence of obesity is increasing, a patient with high BMI and diabetes may not trigger the thought of Cushing’s initially.

We suggest that, in the case of in-patients who have Dilated Cardiomyopathy but no other identifiable cause, Cushing’s Syndrome should be considered in the differential diagnosis and patients should be carefully evaluated with screening tests which are readily-available, non- invasive and in expensive.

References

7. Mario Rotondi, Rosa Dionisio, Dilated cardiomyopathy: a possibly underestimated presentation of Cushing’s disease, Clinical Endocrinology (2011) 75, 864–866
9. Peppa, Melpomeni MD; Ikonomidis I, Dilated Cardiomyopathy as the Predominant Feature of Cushing’s Syndrome. The American Journal of the Medical Sciences Issue: 2009 Sep;338(3):252-3
Table 1. Cases of Dilated Cardiomyopathy associated with Cushing's Syndrome.

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Source of hypercortisolism</th>
<th>EF before treatment</th>
<th>EF after treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Shibusawa et al</td>
<td>2013</td>
<td>Pituitary Adenoma</td>
<td>18%</td>
<td>51%</td>
</tr>
<tr>
<td>2. Rotondi et al</td>
<td>2011</td>
<td>Pituitary adenoma</td>
<td>25%</td>
<td>64%</td>
</tr>
<tr>
<td>3. Ma et al</td>
<td>2010</td>
<td>Pituitary Adenoma</td>
<td>-Reduced-</td>
<td>58%</td>
</tr>
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<td>4. Peppa et al</td>
<td>2009</td>
<td>Adrenal adenoma</td>
<td>45%</td>
<td>60%</td>
</tr>
<tr>
<td>5. Yong et al</td>
<td>2009</td>
<td>Adrenal adenoma</td>
<td>34%</td>
<td>67%</td>
</tr>
<tr>
<td>6. Petramala et al</td>
<td>2007</td>
<td>Adrenal adenoma</td>
<td>35%</td>
<td>60%</td>
</tr>
<tr>
<td>7. Marazuela et al</td>
<td>2002</td>
<td>Adrenal adenoma</td>
<td>25%</td>
<td>69%</td>
</tr>
<tr>
<td>8. Hersbach et al</td>
<td>2001</td>
<td>Pituitary adenoma</td>
<td>25%</td>
<td>50%</td>
</tr>
<tr>
<td>9. Current study</td>
<td>2013</td>
<td>Adrenal adenoma</td>
<td>25%</td>
<td>55%</td>
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</tbody>
</table>
CHOOSING WISELY CANADA UPDATE

The First Inaugural Choosing Wisely Canada National Meeting took place in Toronto on March 30, 2016. The sold-out event focused on implementation of Choosing Wisely Canada lists. The first of a series of toolkits aimed to provide implementation teams with a step-by-step approach to reducing unnecessary utilization were released. The toolkits can be assessed at: http://www.choosingwiselycanada.org/in-action/toolkits/

Those who have demonstrated successful implementation of a Choosing Wisely Canada Recommendation with measurable impact are invited to co-author a toolkit.

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CSIM ANNUAL GENERAL MEETING

The 2016 Annual General Meeting of Members will take place on Thursday, October 27, 2016 at 5:30pm at the Westin Montreal, during the CSIM Annual Meeting 2016 (date and time subject to change).

To review a copy of the 2015 AGM minutes and the financial statements, members may contact info@csim.ca.

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To inculcate in residents, attributes of critical analysis and scholarly pursuit, to enhance their ability to synthesize and communicate their observations or findings for critical evaluation by peers.

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In 2015, Thomson Reuters launched the Emerging Sources Citation Index (ESCI), which will extend the universe of publications in Web of Science™ to include high-quality, peer-reviewed publications of regional importance and in emerging scientific fields.¹

Journals in ESCI are searchable, discoverable, and citable and have passed an initial editorial evaluation.¹ All ESCI journals will be indexed according to the same data standards, including cover-to-cover indexing, cited reference indexing, subject category assignment, and indexing all authors and addresses.¹

SOUMETTEZ UN ARTICLE SUR VOS TRAVAUX DE RECHERCHE À LA REVUE CANADIENNE DE MéDECINE INTERNE GÉNÉRALE!

La Revue canadienne de médecine interne générale (CJGIM) est la publication officielle de la Société canadienne de médecine interne. La revue avec comité de lecture est publiée quatre fois par année et son accès est gratuit en ligne.

Nous sommes fiers de vous annoncer que la Revue canadienne de médecine interne générale a été choisie pour faire partie du nouveau Emerging Sources Citation Index de Thomson Reuters!

En 2015, Thomson Reuters a introduit le Emerging Sources Citation Index (ESCI), qui permettra désormais à l’univers des publications du Web of Science™ d’inclure des publications à comité de lecture de haute qualité qui sont d’importance régionale et qui traitent de domaines scientifiques émergents.¹

Les revues du ESCI sont des références accessibles, interrogeables et dignes d’être rapportées.¹ Toutes les revues du ESCI sont répertoriées selon des normes communes en ce qui a trait aux données, avec notamment un index couvrant l’entièreté de la revue, un index des références citées, l’affectation d’une catégorie aux sujets traités, ainsi qu’un index des auteurs et leurs coordonnées.¹

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