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The relative effectiveness of practice change interventions in overcoming common barriers to change: A survey of 14 hospitals with experience implementing evidence-based guidelines.

Fiona Simpson¹ MSc (Nutrition and Dietetics) and Gordon S. Doig² PhD (Epidemiology and Biostatistics)

From: ¹ Department of Nutrition, Royal North Shore Hospital, Sydney, Australia and Human Nutrition Unit, University of Sydney, Sydney, Australia. ² Intensive Care Unit, Royal North Shore Hospital, Sydney, Australia and Northern Clinical School, University of Sydney, Sydney, Australia.

Corresponding author: (Reprints will not be ordered)

Dr Gordon Doig

Royal North Shore Hospital – ICU

Pacific Highway,

St Leonards, NSW, 2065.

E-mail: gdoig@med.usyd.edu.au

Phone: (02) 9926 8656

Fax: (02) 9439 8418.

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ABSTRACT

Aims and Objectives: Changing practice to reflect current best evidence can be costly and time consuming. The purpose of this survey was to determine the optimal combination of practice change interventions needed to overcome barriers to practice change commonly encountered in the intensive care unit (ICU).

Design: A survey instrument delivered by mail with e-mail follow-up reminders.

Setting: The intensive care units of 14 hospitals throughout Australia and New Zealand.

Subjects: Individuals responsible for implementing an evidence-based guideline for nutritional support in the ICU.

Interventions: Practice change interventions were ranked in order of effectiveness and barriers to change were ranked in order of how frequently they were encountered.

Results: A response rate of 100% was achieved. Interventions traditionally regarded as strong (academic detailing, active reminders) were ranked higher than those regarded as moderate (audit and feedback), or weak (posters, mouse mats). The high ranks of the site initiation visit (educational outreach) and in-servicing (didactic lectures) were unexpected, as was the relatively low rank of educationally influential, peer-nominated opinion leaders. Four hospitals reported the same physician related barrier as 'most common' and the remaining ten hospitals reported three different physician related barriers, two nursing related barriers and three organisational barriers as most common.

Conclusions: When designing a multifaceted, multicentre change strategy, the selection of individual practice change interventions should be based on: an assessment of available resources; recognition of the importance of different types of barriers to different sites; the potential for combinations of interventions to have a synergistic effect on practice change and; the potential for combinations of interventions to actually reduce workload.

INTRODUCTION

Approximately 30% of all hospitalised patients fail to receive care in line with current scientific evidence (Schuster *et al.* 1998; Buchan 2004). Implementing evidence-based guidelines (EBGs) is one way to promote interventions with proven benefits and thus improve patient care (Woolf *et al.* 1999; Martin *et al.* 2004). Unfortunately, the successful implementation of EBGs can be difficult, costly and time-consuming (Grimshaw *et al.* 2004a).

Although published EBGs may influence readers' perceptions regarding acceptable patient care (Grol & Wensing 2004), this knowledge often never translates into practice change (Lomas *et al.* 1989). Many theoretical models have been proposed to help better understand this research transfer failure, and most promote the use of formal practice change interventions in order to achieve "knowledge translation" (Davis *et al.* 2003).

Practice change interventions range in complexity from simple information mail outs to formal academic detailing (Grimshaw *et al.* 2001). Because no single practice change intervention has been found to be effective in all clinical settings, the most effective and robust way to achieve knowledge translation is to use a multifaceted change strategy composed of as many specific practice change interventions as possible (Grimshaw *et al.* 2004a). Use of a comprehensive change strategy makes effective guideline implementation both costly and time-consuming (Grimshaw *et al.* 2004a).

To determine the optimal combination of practice change interventions needed to successfully overcome commonly encountered barriers to change, we conducted a survey of individuals with extensive experience implementing EBGs.

METHODS

Context

From October 2003 to June 2004, 27 hospitals (13 of which remained as controls) from throughout Australia and New Zealand participated in a cluster randomised trial to develop, implement and evaluate an EBG for nutritional support of the critically ill patient.

Two site-investigators from each of the 14 guideline hospitals (an ICU consultant and an ICU dietitian) participated in a two-day guideline development conference that used Browman's Clinical Practice Guideline Development Cycle (Browman *et al.* 1995) to update a pre-existing, previously validated EBG (Martin *et al.* 2004). The details of this process and results of the consensus conference have been published elsewhere (Doig & Simpson 2005).

The two day guideline development conference also included a workshop that outlined the components of a multifaceted change strategy that was to be used to implement the EBG. The multifaceted change strategy was composed of the following specific practice change interventions:

1) Site initiation visit

Interactive lecture-style presentations on the content of, and processes used to develop, the EBG, followed-up by one-on-one academic detailing. Conducted by the project chief investigators (FS and GSD) and delivered to ICU consultants and staff.

2) Academic detailing

Site investigators conducted one-on-one conversations with any staff member or clinician not compliant with the EBG in order to address their individual concerns and persuade them to change behaviour through the provision of information or evidence (Gross & Pujat 2001). Copies of original scientific papers, single page critical appraisal summaries and a visually attractive resource book that contained systematic reviews of

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the evidence were provided to support academic detailing. Early adopters were identified and used as positive examples during these academic detailing sessions to convince laggards to change practice (Borbas *et al.* 2000).

3) Peer nominated educationally influential opinion leaders

ICU nurses, consultants and surgeons who admitted patients to the study ICU were surveyed to identify educationally influential opinion leaders from each respective discipline (Borbas *et al.* 2000) using a validated instrument (Hiss *et al.* 1978). Peer nominated opinion leaders were educated on the content of, and processes used to develop, the EBG and provided with copies of all visually attractive detailing aids.

4) Active reminders

Site investigators reviewed ICU patients twice daily to assess compliance with the EBG. When a patient qualified for care under the EBG, this was communicated directly to staff and clinicians by a short friendly chat.

5) Timely audit and feedback

Key measures of guideline compliance were recorded and entered into a secure study web server. Site investigators were able to print control-chart graphs to compare their ICU's performance with the 13 other guideline hospitals.

6) Passive reminders

Brightly coloured copies of the EBG, presented in algorithmic format, were posted in high traffic areas (A3 sized posters), by the patients' bedside (A4 sized laminated sheets) and next to each ICU computer station (mouse mats).

7) In-servicing

A series of interactive lecture-style presentations were conducted by site investigators to introduce the EBG to ICU staff and clinicians. The number and timing of in-servicing sessions varied between hospitals based on need and schedules.

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Practice change observed

The degree of practice change observed in this current study was similar in magnitude to the change achieved in other publications in this field. Changes of this magnitude have previously been associated with improvements in patient oriented outcomes (Martin *et al.* 2004).

Sampling frame

The dietitian site investigator was primarily responsible for the day-to-day implementation of the EBG and was the recipient of this survey. Approval to evaluate the success of the guideline implementation was obtained from each participating site's Human Research Ethics Committee.

Survey processes

A survey instrument, comprising two questions and four clinical scenarios, was developed and pilot tested on a member of the intended sampling frame. The survey was administered by mail in June 2004 and a reply paid (stamped) response envelope was provided in the mail out (Choi *et al.* 1990). Follow-up was by e-mail and surveys were re-mailed if the original was reported as lost or not yet returned. All respondents were assured of confidentiality and anonymity.

Survey instrument

Question one listed and described 18 specific practice change interventions that the respondents had been trained to employ to implement the evidence-based nutritional support guideline. The respondents were then asked, based on their experiences with the current project, to rank the 10 practice change strategies they would use if they had to implement the guideline again.

Question two listed and described 13 barriers to change. Twelve of the barriers had been previously reported as significant problems by at least one hospital during the

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conduct of the trial. The thirteenth option was left blank to allow the respondents to describe and rank a barrier that was unique to their own hospital. The respondents were then asked to rank the top five barriers in terms of how frequently they caused problems with guideline implementation in their ICU.

Questions three to six described clinical scenarios that represented a commonly encountered barrier to change: 1) a physician barrier, where the physician was unfamiliar with the content of the EBG; 2) a mixed organisation / physician barrier, where audit of a process measure demonstrated performance inconsistent with the EBG that could have been attributed to a lack of compliance at the physician level or an inability to offer care due to lack of pharmacy support (an organisational factor); 3) a nursing barrier, where the bedside nurse was unfamiliar with the content of the EBG and; 4) a physician barrier, where the physician was familiar with the content of the EBG but still reluctant to change practice.

Respondents were asked to indicate a sequence of three practice change interventions they would use to overcome each scenario barrier. Each subsequent intervention assumed the previous practice change intervention had failed.

Data Treatment

Data was analysed using simple descriptive statistics.

RESULTS

Participating ICUs

The ICU's participating in this survey were located in Australia (13) and New Zealand (1) and admitted a mix of adult medical and surgical intensive care patients. The median size of the 14 ICUs participating in this survey was 12 beds, with a range from 5 to 18 beds. Thirteen ICU's were tertiary referral units capable of providing comprehensive

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critical care, and one was a private hospital, capable of providing a high standard of general intensive care.

Response rate

Twelve of 14 surveys (86%) were returned after the initial mail-out. E-mail follow-up resulted in a final response rate of 14/14 (100%).

Survey Responses

Question 1. Most successful change interventions

All 18 practice change interventions formerly utilised in the EBG implementation project received a top ten rank from at least two respondents. The only practice change intervention ranked in the top ten by *all* 14 hospitals was the use of active reminders (short friendly chats), which received a median rank of 5. Table 1 provides a detailed list of the rankings of all practice change interventions.

Question 2. Most frequent barriers to change

Of the 12 barriers described in the survey, eleven received a top five ranking by at least one hospital. The three highest ranked barriers included one each of a physician, nursing and organisation related barrier to change. Eight additional barriers were listed in the open text response. Six were unique physician related barriers and two were organisation related barriers. Table 2 provides a detailed list of responses.

Clinical scenarios

Question 3. The intervention most frequently selected as the initial approach to address this physician barrier was a short friendly chat (active reminder), selected by six of 14 respondents. If this initial intervention failed, respondents (5 / 14) indicated they would ask the offending physician to attend a formal in-service session conducted by the ICU consultant co-investigator. If the in-service failed to result in a practice change, 6 / 14

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would initiate peer to peer academic detailing, to be conducted by the ICU consultant co-investigator.

Question 4. Most respondents indicated they would address this mixed physician/organisational barrier by actively promoting the results of the comparative audit (6 / 14) (timely audit and feedback). If direct feedback of the timely audit failed to change practice, most respondents indicated they would follow-up with academic detailing conducted by either the ICU dietitian co-investigator or the ICU consultant co-investigator.

Question 5. A majority of respondents (11 / 14) indicated they would initially address a nursing-related barrier with a short friendly chat (active reminder). If this initial intervention failed to change practice, respondents indicated they would ask the nurse to attend a formal in-service session conducted by the ICU dietitian co-investigator (5 / 14). If the in-service failed to change practice, 6 / 14 indicated they would conduct peer to peer academic detailing (conducted by the ICU dietitian co-investigator).

Question 6. This scenario began by stating that all practice change interventions conducted by the ICU dietitian site investigator had failed to convince a reluctant physician to change practice. In this scenario, the most frequently chosen interventions were peer to peer academic detailing, conducted by either the ICU consultant co-investigator or the peer nominated opinion leader.

Table 3 provides a complete list of the responses to the four clinical scenarios.

DISCUSSION

We surveyed individuals with experience implementing EBGs to determine the optimal combination of practice change interventions needed to overcome commonly encountered barriers to change. Of the 18 specific practice change interventions respondents had experienced, all were deemed to be successful in overcoming barriers to change. Furthermore, respondents identified a wide variety of barriers to practice change

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that were shared between hospitals, and listed additional barriers that were unique to, but commonly encountered within, particular hospitals.

Based on the results of this survey, we recommend that a multifaceted change strategy should be composed of a wide variety of practice change interventions. Each intervention should be selected because it is known to be strongly effective or efficient at overcoming specific barriers to change. When selecting combinations of interventions, consideration should be given to the likelihood that certain practice change interventions may enhance the effectiveness of others.

Previous authors have stated that there are "no magic bullets" (Oxman *et al.* 1995), with no single practice change intervention effective in all clinical settings (Grimshaw *et al.* 2004a; Grimshaw *et al.* 2001; Davis *et al.* 1995; Davis *et al.* 1997; Grol & Grimshaw 2003). Our survey failed to find any "dud bullets", with no practice change intervention consistently ranked *ineffective* (Table 1). Although there is agreement that multifaceted change strategies are crucial when improving patient care, controversy remains as to what constitutes the optimal combination of practice change interventions (Grimshaw *et al.* 2004a; Grimshaw *et al.* 2001; Grimshaw *et al.* 2004b). Currently, it is recommended that the selection of a practice change intervention for inclusion in a multifaceted change strategy should be based on "an assessment of available resources, the importance of perceived barriers to change and research evidence supporting the effectiveness and efficiency of the change intervention" (Oxman *et al.* 1995).

Importance of perceived barriers to change

Much research has been conducted on identifying and understanding the importance of barriers to change (Grol & Wensing 2004). Although the rationale for choosing different practice change interventions in the presence of different types of barriers remains empirical (Grimshaw *et al.* 2004a), it is widely accepted that planning for

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change needs to take into account the relative importance of potential barriers (Grol & Wensing 2004, Cook *et al.* 2002).

In our survey, respondents from 14 hospitals ranked nine different barriers as the most commonly encountered barrier to change in their hospital (Table 2). Four hospitals reported the same physician related barrier and the remaining ten hospitals reported three different physician related barriers, two nursing related barriers and three organisational barriers as most common. Although there were many barriers that were shared between hospitals, it is important to note the high degree of variability in the type of barrier ranked as most important.

Because of the variability by site, we strongly recommend that planning for change across multiple sites needs to account for the relative importance of *different types* of potential barriers *at each site*. Failure to recognise the variable importance of different barriers at different sites could result in a change strategy that places unwarranted emphasis on a practice change intervention that addresses only one type of barrier.

Relative effectiveness of practice change interventions

Various authors have attempted to quantify the relative effectiveness of practice change interventions by rating them as strong, moderate or weak (modest) (Grimshaw *et al.* 2004a; Grimshaw *et al.* 2001; Davis *et al.* 1997; Davis *et al.* 1995; Bero *et al.* 1998). Others have suggested that comparing the strength of different interventions based on results observed in studies conducted in a wide range of settings targeting different behaviours may not provide the most reliable estimates of relative effectiveness (Grimshaw *et al.* 2004a). The ranking of effectiveness obtained in our survey compares the perceived strength of each practice change intervention within the context of one study conducted in similar settings targeting the same behaviour.

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In general, survey respondents ranked interventions traditionally regarded as strong (academic detailing, active reminders) higher than those regarded as moderate (audit and feedback), or weak (posters, mouse mats) (Table 1). The high ranking of the site initiation visit (educational outreach) and traditional in-servicing (didactic lectures) was unexpected, as was the relatively low ranking of the educationally influential, peer-nominated opinion leaders.

A comprehensive review of practice change interventions concluded that "educational outreach may result in modest improvements in process of care, but this needs to be offset against both the resources required to achieve this change and practical considerations" (Grimshaw *et al.* 2004a). This overall conclusion is predominantly based on evaluations of educational outreach unsupported by other practice change interventions. In our guidelines implementation project, educational outreach was supported directly by academic detailing and indirectly by numerous other interventions.

In theoretical models, the first steps toward change involve gaining an awareness of the possibility of change and recognising the need to change (Prochaska & Velicer 1997). It is possible that the site initiation visits (educational outreach) achieved modest direct change however they likely increased the awareness of the potential to benefit from change, thus leveraging the effectiveness of other practice change interventions. Irregardless of the actual mechanism of action, respondents ranked the site initiation visit as the most effective practice change intervention.

Our survey defined *in-servicing* as "lecture-style presentations given to a group of individuals". As with the site initiation visits, it is also possible that in-servicing was viewed as an effective intervention because it predisposed practitioners to change (Prochaska & Velicer 1997), and primed them to respond to other practice change interventions.

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Generalising the results of studies that have evaluated the impact of individual change interventions, such as educational outreach or in-servicing, to situations where these interventions are components of multifaceted change strategies may not be appropriate. Others have suggested that combinations of change interventions may have non-additive synergistic effects (Grimshaw *et al.* 2004a). The site initiation visit and in-servicing may have ranked highly in our survey because of a leveraging (synergistic) effect that they had on other change interventions. The potential for these two interventions to leverage other change interventions must be considered when developing a multifaceted change strategy.

Opinion leaders, who were viewed by their peers as "caring and humanistic", who "express themselves clearly" and who "like to teach" were identified using a validated instrument (Hiss *et al.* 1978) but they were not given an explicit role or task in the EBG implementation project. They were identified, educated and provided with detailing aids under the assumption that their peers would eventually seek their opinion on the new EBG. The survey respondents may not have been aware of how many times their colleagues approached each respective opinion leader for advice concerning the guideline. It is possible opinion leaders were more effective than their ranking indicates.

Relative efficiency of practice change interventions

Little is known about the *efficiency* of various practice change interventions and, currently costs are estimated by considering up-front resources (time) consumed delivering the intervention. Just as the net effect of combining interventions could be greater than the sum of their individual effects (synergism) (Grimshaw *et al.* 2004a), it is also possible that efficiencies (time savings) could be achieved. Responses to clinical scenario Questions Three and Six, which represent uncomplicated physician and nursing barriers to change, illustrate how these efficiencies may be realised.

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Presented with an uncomplicated barrier to change, respondents indicated they would use an active reminder (short friendly chat) to alter practitioner behaviour as a first response. If the short friendly chat failed to change practice, respondents indicated they would follow-up with formal in-servicing or peer to peer academic detailing. Given that both academic detailing and formal education consume more time than a short friendly chat, this sequence of interventions is time efficient. Indeed, because active reminders can be considered a strong to moderate change intervention, it is likely few academic detailing sessions would need to be undertaken in follow-up. If active reminders had not been a component of the multifaceted change strategy, it is likely more time would have been required to undertake academic detailing. Based on these findings, we recommend consideration be given to efficiencies in workload gained by including certain practice change interventions in combination with others.

Limitations of the survey

This survey reflects the self-reported impressions of 14 individuals, from different hospitals, with formal experience implementing EBGs. We do not know whether the interventions that were *perceived* to be the most effective by respondents were in fact the most frequently used strategies or the most effective in overcoming barriers to change. Although the majority of the survey results were consistent with published literature, some findings were unexpected.

We did not collect information on individual clinicians' responses to specific practice change interventions but we do know that the magnitude of practice change achieved overall could be considered to be clinically important (Martin *et al.* 2004). Future observational studies or well conducted factorial, or fractional factorial, interventional trials may be required to establish whether individual practice change interventions do have synergistic effects, or realise efficiencies, when added to a multifaceted change strategy.

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Conclusions

It is well known that evidence is not effectively translated into clinical practice, and whilst evidence-based guidelines may impart knowledge, publication alone is unsuccessful in achieving sustained behaviour change. The evidence supporting the use of particular practice change interventions remains incomplete; however our survey results continue to support the use of a multifaceted approach.

When designing a multifaceted, multicentre change strategy, our results suggest that the selection of individual practice change interventions should be based on: an assessment of available resources; a recognition of the importance of different types of barriers to different sites; research evidence supporting the effectiveness of combinations of interventions and; recognition that workload may be reduced by using certain interventions in combination.

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REFERENCES

Bero LA, Grilli R, Grimshaw JM, Harvey E, Oxman AD, Thomson MA. Closing the gap between research and practice: an overview of systematic reviews of interventions to promote the implementation of research findings. The Cochrane Effective Practice and Organization of Care Review Group. *BMJ* 1998; 317(7156):465-468.

Borbás C, Morris N, McLaughlin B, Asinger R, Gobel F. The role of clinical opinion leaders in guideline implementation and quality improvement. *Chest* 2000; 118(2 Suppl):24S-32S.

Browman GP, Levine MN, Mohide EA, Hayward RS, Pritchard KI, Gafni A et al. The practice guidelines development cycle: a conceptual tool for practice guidelines development and implementation. *J Clin Oncol* 1995; 13(2):502-512.

Buchan H. Gaps between best evidence and practice: causes for concern. *Med J Aust* 2004; 180(6 Suppl):S48-S49.

Choi BC, Pak AW, Purdham JT. Effects of mailing strategies on response rate, response time, and cost in a questionnaire study among nurses. *Epidemiology* 1990; 1(1):72-74.

Cook DJ, Meade MO, Hand LE, McMullin JP. Toward understanding evidence uptake: semirecumbency for pneumonia prevention. *Crit Care Med* 2002; 30(7):1472-1477.

Davis D, Evans M, Jadad A, Perrier L, Rath D, Ryan D et al. The case for knowledge translation: shortening the journey from evidence to effect. *BMJ* 2003; 327(7405):33-35.

Davis DA, Taylor-Vaisey A. Translating guidelines into practice. A systematic review of theoretic concepts, practical experience and research evidence in the adoption of clinical practice guidelines. *CMAJ* 1997; 157(4):408-416.

Davis DA, Thomson MA, Oxman AD, Haynes RB. Changing physician performance. A systematic review of the effect of continuing medical education strategies. *JAMA* 1995; 274(9):700-705.

Doig GS, Simpson F. Evidence-Based Guidelines for Nutritional Support of the Critically Ill: Results of a Bi-National Guideline Development Conference. Sydney: EvidenceBased.net, 2005.

Grimshaw J, Eccles M, Tetroe J. Implementing clinical guidelines: current evidence and future implications. *J Contin Educ Health Prof* 2004b; 24 Suppl 1:S31-S37.

Grimshaw JM, Shirran L, Thomas R, Mowatt G, Fraser C, Bero L et al. Changing provider behaviour: an overview of systematic reviews of interventions. *Med Care* 2001; 39(8 Suppl 2):II2-45.2

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- Simpson F and Doig GS. The relative effectiveness of practice change interventions in overcoming common barriers to change: A survey of 14 hospitals with experience in implementing evidence-based guidelines. *Journal of Evaluation in Clinical Practice* 2007 Oct;13(5):709-15.
- Grimshaw JM, Thomas RE, MacLennan G, Fraser C, Bero L et al. Effectiveness and efficiency of guideline dissemination and implementation strategies. *Health Technol Assess* 2004a; 8(6):iii-72.
- Grol R, Grimshaw J. From best evidence to best practice: effective implementation of change in patients' care. *Lancet* 2003; 362(9391):1225-1230.
- Grol R, Wensing M. What drives change? Barriers to and incentives for achieving evidence-based practice. *Med J Aust* 2004; 180(6 Suppl):S57-S60.
- Gross PA, Pujat D. Implementing practice guidelines for appropriate antimicrobial usage: a systematic review. *Med Care* 2001; 39(8 Suppl 2):II55-II69.
- Hiss RG, Macdonald R, Davis WK. Identification of Physician Educational Influentials (EI's) in Small Community Hospitals. Proceedings Seventeenth Annual Conference on Research in Medical Education, 283-288. 1978.
- Lomas J, Anderson GM, Domnick-Pierre K, Vayda E, Enkin MW, Hannah WJ. Do practice guidelines guide practice? The effect of a consensus statement on the practice of physicians. *N Engl J Med* 1989; 321(19):1306-1311.
- Martin CM, Doig GS, Heyland DK, Morrison T, Sibbald WJ. Multicentre, cluster-randomized clinical trial of algorithms for critical-care enteral and parenteral therapy (ACCEPT). *CMAJ* 2004; 170(2):197-204.
- Oxman AD, Thomson MA, Davis DA, Haynes RB. No magic bullets: a systematic review of 102 trials of interventions to improve professional practice. *CMAJ* 1995; 153(10):1423-1431.
- Prochaska JO, Velicer WF. The transtheoretical model of health behaviour change. *Am J Health Promot* 1997; 12(1):38-48.
- Schuster MA, McGlynn EA, Brook RH. How good is the quality of health care in the United States? *Milbank Q* 1998; 76(4):517-563.
- Wolf SH, Grol R, Hutchinson A, Eccles M, Grimshaw J. Clinical guidelines: potential benefits, limitations, and harms of clinical guidelines. *BMJ* 1999; 318(7182):527-530.

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Table 1: Relative ranking of practice change interventions.

Practice change intervention	Median rank 1 = most successful	Range	Number of top ten rankings
Site initiation visit (interactive lectures and academic detailing conducted by project chief investigators)	3	1 - 9	12 / 14
Academic detailing conducted by clinician site investigator using visually attractive resource book	3	1 - 10	11 / 14
In-servicing conducted by clinician site investigator	4	1 - 8	12 / 14
Academic detailing conducted by dietitian site investigator using critical appraisal summary sheets	4	1 - 7	3 / 14
In-servicing conducted by dietitian site investigator	4.5	1 - 10	12 / 14
Short friendly chat / reminder delivered by dietitian site investigator	5	1 - 10	14 / 14
Academic detailing conducted by dietitian site investigator using visually attractive resource book	5	1 - 8	9 / 14
Use of web-based audit and feedback by dietitian site investigator	5	2 - 10	9 / 14
Academic detailing conducted by clinician site investigator using original scientific papers	5	1 - 10	8 / 14
Academic detailing conducted by peer-nominated opinion leader using visually attractive resource book	6	2 - 8	5 / 14
In-servicing conducted by nursing staff	6	2 - 10	5 / 14
Academic detailing conducted by dietitian site investigator using original scientific papers	6	3 - 9	4 / 14
A4 laminated copies of guidelines at bedside	7	2 - 10	13 / 14
Academic detailing conducted by clinician site investigator using critical appraisal summary sheets	7	2 - 9	4 / 14
A3 (large) guideline posters placed in high traffic areas	8	3 - 10	9 / 14
Academic detailing conducted by peer-nominated opinion leader using critical appraisal summary sheets	8	7 - 9	5 / 14
Mouse mats located at computers throughout ICU	9	8 - 10	3 / 14
Academic detailing conducted by peer-nominated opinion leader using original scientific papers	9.5	9 - 10	2 / 14

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Table 2: Relative ranking of barriers to change.

Barrier to change	Median 1 = most frequent	Range	Number of top five rankings
New orders for parenteral nutrition not filled by pharmacy on weekends/after hours.	1	1 - 1	1 / 14
Site specific barrier (open text response)	2	1 - 5	9 / 14
Physician reluctant to start enteral nutrition on post-operative patients.	2	1 - 5	8 / 14
Nurse fails to restart enteral nutrition after a scheduled procedure.	2	1 - 5	7 / 14
Nurse reduces enteral nutrition rate in response to low gastric residual volumes.	3	1 - 5	8 / 14
Physician reluctant to provide short term (< 3 days) parenteral nutrition.	3	1 - 5	8 / 14
Inability to arrange placement of a jejunal feeding tube.	3	1 - 4	7 / 14
Physician reluctant to start prokinetics despite high gastric residual volumes.	3	3 - 5	3 / 14
Physician reluctant to start enteral nutrition until bowel sounds return.	3	1 - 4	2 / 14
ICU has a pre-existing guideline that recommends a specific starting rate for enteral nutrition. General reluctance (physician and nursing) to replace pre-existing guideline with new guideline.	3	3 - 3	1 / 14
Nurse reduces enteral nutrition due to diarrhoea.	4	3 - 5	5 / 14
Physician reluctant to provide short term (< 3 days) enteral nutrition.	5	3 - 5	5 / 14
New orders for enteral nutrition not filled by ICU on weekends/after hours.	Not ranked		0 / 14

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Table 3: Practice change interventions selected to overcome specific barriers to change

Practice change intervention	Scenario 1 Physician barrier (unfamiliar with guideline)			Scenario 2 Mixed barrier (audit shows poor performance)			Scenario 3 Nursing barrier (not following guideline)			Scenario 4 Physician barrier (very reluctant to change)		
	1 st	2 nd	3 rd	1 st	2 nd	3 rd	1 st	2 nd	3 rd	1 st	2 nd	3 rd
Short friendly chat / active reminder delivered by dietitian.	6	1	1	4	2	2	11	0	1	3	2	1
Academic detailing conducted by dietitian.	2	2	1	1	4	2	1	4	1	Scenario reports as "already failed".		
Academic detailing conducted by intensivist.	2	3	6	1	3	5	0	0	4	5	4	3
Academic detailing conducted by opinion leader.	0	1	1	0	1	1	0	0	2	0	3	4
Use of web-based audit and feedback.	1	1	2	6	2	2	0	0	0	0	2	3
Traditional in-servicing by dietitian.	1	1	0	1	0	1	1	6	0	2	0	0
Traditional in-servicing by intensivist.	1	5	2	1	2	1	0	0	3	4	3	2
Traditional in-servicing by nursing staff.	0	0	1	0	0	0	0	3	1	0	0	0
Use of posters, laminated copies of guideline and mouse mats.	1	0	0	0	0	0	1	1	2	0	0	1

1st : Number of respondents who would use this intervention as a first response to the barrier. 2nd : Number of respondents who would use this intervention as a second response if the first intervention fails. 3rd : Number of respondents who would use this intervention as a third response if both previous interventions failed.