Complex cases in primary care: report of a CME-certified series addressing patients with multiple comorbidities

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SUMMARY

Aim: To assess whether participation in a series of continuing medical education-certified activities presenting complicated case scenarios resulted in evidence-based decision making for patients with chronic comorbid conditions. Methods: A series of interactive live workshops and online case studies presented evidence-based, practical information addressing the care of patients with multiple chronic diseases to primary care physicians. Clinical case vignettes were used to assess workshop participant knowledge and competence. Results were compared with those of matched non-participant controls. Online participants were surveyed to evaluate immediate knowledge gains from the activity. Results: Overall, physician workshop participants were 27% more knowledgeable of evidence-based treatment decisions. Participants were more likely to refer a patient with rheumatoid arthritis to a rheumatologist (57% vs. 36%; \( p = 0.035 \)) and showed better recognition of medications that can contribute to overactive bladder symptoms (36% vs. 18%; \( p = 0.043 \)) compared with non-participant controls. Non-significant differences in favour of participants included evidence-based decisions regarding the management of osteoporosis, attention deficit hyperactivity disorder in adults and type 2 diabetes mellitus in adolescents. Online participants demonstrated significant knowledge gains (\( p < 0.001 \)) on 17 of 18 assessment questions across all therapeutic areas. Discussion: Chronic comorbid conditions afflict a sizable minority of patients. However, specific recommendations and education surrounding patient management are often overlooked because of the inherent difficulty of treating this group. Highly interactive educational activities can improve participant knowledge and competency in treating these patients by providing an opportunity to interact with faculty experts, receive immediate feedback and practice new skills. Conclusion: Interactive educational activities that discuss complicated case scenarios can improve participant application of evidence-based medicine for patients with multiple chronic comorbidities.

Introduction

Chronic illness, such as hypertension, heart disease, diabetes, respiratory disease and arthritis, affects nearly one half of the US population and is responsible for 7 of 10 deaths annually (1,2). This type of illness requires ongoing care and exacts a significant toll on the healthcare system, especially when patients have more than one condition (1,2). A 2005 study found that approximately 20% of Americans were living with multiple chronic conditions, but this subset of the population was responsible for 65% of total healthcare spending (3,4). This burden increases even more with age; roughly two thirds of adults 65 years and older have more than one chronic illness, and the care of these patients represents 95% of all Medicare spending (1,4). Factors such as these – especially when placed in the current context of an ageing population, increasing clinician workload, rising medical costs and fewer new primary care professionals graduating from medical schools – combine to create a ‘perfect storm’ that makes it more challenging than ever to stay abreast of current evidence and optimally and efficiently care for patients who present with a complicated combination of chronic conditions.

Accredited providers of continuing medical education (CME) are well positioned to help address this challenge by providing focused and applicable education to increase clinician knowledge and competency.
in the management of multiple chronic conditions. Research into factors that contribute to the successful transfer of evidence-based knowledge to medical practice suggests that the framework of CME interventions is paramount. New clinical information becomes more relevant when it is presented in the context of an authentic work setting, which frequently involves complex, problem-centred patient scenarios in the case of primary care professionals. Its relevance is also enhanced when peers can openly discuss and debate their insights, clinical opinions and treatment approaches with one another. Presenting and discussing clinical information in these practical ways facilitates its application to individual practice.

In 2011, Duke University School of Medicine, Office of Continuing Medical Education (DukeCME) partnered with an accredited CME provider to address the need for efficient, practical and timely education through the Complex Cases in Primary Care series. Approved by the American Academy of Family Physicians, this multifaceted series presented complicated case scenarios that were developed by a faculty steering committee (primary care and specialist experts) and designed to simulate real-world patient encounters and contemporary challenges encountered in primary care. This CME-certified series, offered in both live and online formats, illustrated strategies for implementing current evidence, national standards and guideline-based care into practice. The design and outcomes of the live workshops and online case studies offered through this initiative are described herein.

Methods

Topic areas

The Complex Cases in Primary Care series addressed multiple chronic disease states, including atherosclerosis, attention deficit hyperactivity disorder (ADHD) in adults, chronic pain, type 2 diabetes mellitus (T2DM), osteoporosis, overactive bladder (OAB) and rheumatoid arthritis (RA). A preliminary list of therapeutic areas, representing clinical areas in which primary care professionals play a key role in identification and/or management, was identified based on independent educational needs assessments conducted by DukeCME and the accredited CME provider. External financial support was sought so that the education could be complimentary for clinicians, and final topics were determined based on the receipt of grant funding from independent medical education departments of various pharmaceutical supporters (see Acknowledgements).

The chronic conditions selected for inclusion in this series were combined by steering-committee fac-ulty into complicated, realistic case scenarios that formed the basis of the live workshops and online case studies. These cases synthesised current clinical evidence with broader strategies associated with successfully managing patients with multiple comorbidities, such as improving medication adherence, following treatment recommendations, engaging patients in self-care, promoting lifestyle change, improving functional status and co-ordinating care across a multidisciplinary team. All content was vetted through an independent, external compliance review to ensure that it was free of commercial bias.

Live, interactive workshop series

Five half-day workshops incorporating both large-group presentations and small-group discussions were conducted between September and December 2011. In the large-group presentations, which combined didactic elements with dynamic faculty–participant interactions, primary care faculty reviewed and discussed clinical evidence, contemporary practice guidelines and available treatment algorithms in the context of complex patient cases. Lessons learned from these presentations were immediately applied in the small-group discussions, during which participants worked in teams to address challenging clinical questions and develop diagnostic and treatment plans in several short case studies. Participants were asked to complete an evaluation at the conclusion of the workshop to document both their participation in and satisfaction with the activity.

Workshop outcomes

The effect of the educational intervention was assessed at least 30 days after the workshops using an online ‘follow-up’ survey, which included case-vignette-based knowledge questions to address the multiple clinical topics as well as questions about physician confidence and barriers to the optimal management of patients with multiple comorbidities. The survey was sent to the subset of workshop participants who identified themselves as physicians; it was also administered to a representative, demographically matched control group of primary care physicians who did not participate in the workshop series (non-participant controls) to assess differences in practice choices associated with activity participation. The matching process for the non-participant controls was performed based on demographic information only, independent of survey responses.

The participant follow-up survey was split into two sections to reduce time requirements and to ensure that an adequate sample size would be collected. All activity participants contacted had the opportunity to complete both sections. Non-partici-
Online case-study series

The live workshop education served as the basis for the development of six CME-certified, interactive online case studies, which were available from December 2011 to December 2012. Each case study addressed evidence-based management strategies for patients with multiple comorbid conditions and incorporated multiple-choice questions throughout to emphasise key learning points. The effectiveness of these certified activities was measured by knowledge- and competence-based assessment questions administered before and immediately after each case study.

Statistical analyses

Data from the follow-up survey were analysed using PASW (version 18.0) software (SPSS Inc., Chicago, IL). Chi-squared analyses and paired t-tests were used to compare survey responses. Results were considered statistically significant if the probability values were < 0.05. An effect size, using Cohen’s d formula, was calculated to determine the difference between workshop participants and non-participant controls relative to evidence-based management choices (6). The effect size is expressed as a non-overlap percentage, or the percentage achieved by workshop participants that was not reflected in the evidence-based responses of the non-participant controls.

Chi-squared analyses and paired t-tests were employed to evaluate immediate knowledge gains as a result of participation in the online case-study activities. Results were considered statistically significant if the probability values were < 0.05.

Results

Series participant demographics

In total, 1479 clinicians participated in the 2011 Complex Cases in Primary Care educational series. The demographic composition of the participants in the live workshops and online case studies is provided in Table 1. There were 487 participants in attendance across the five workshops and 992 participants who completed one or more of the six CME-certified online case-study activities.

The breakdown of the participants’ degree type was similar across the two platforms; the majority were physicians (MD/DO; 63% in the workshops; 61% in the online activities) or nurse practitioners (23% in the workshops; 20% in the online activities). The most common specialties identified by participants were family practice (46% in the workshops; 38% in the online activities) and internal medicine (24% in both platforms).

Complex cases

The complex case scenarios that served as the foundation for this activity combined multiple chronic conditions into individual patient vignettes and provided a context for presenting relevant clinical evidence and standards of care, discussing practice-based challenges related to patient management and debating (among faculty and participants) optimal management approaches. An example of a case vignette, corresponding clinical guidelines and take-home clinical pearls presented in this series is provided in Table 2.

Workshop outcomes

Immediately following the workshops, nearly all participants indicated that the activity increased their knowledge and competence (96%, n = 449; 89%, n = 443, respectively). Most participants also indicated that the activity provided fair and balanced content free from commercial bias (98%, n = 438).

Thirty days after the workshops, 247 physician participants were contacted and given the opportunity to complete both follow-up surveys covering all disease areas that were addressed in the live activity (see Data S1 and S2). Of these 247 participants, 62 completed at least one of the surveys, for a response rate of 25%. There were 50 responses for the first survey and 49 responses to the second. A sample of 50 responses from a comparator group of demographically similar non-participant control physicians was also collected (Table 3).

Workshop participants demonstrated knowledge gains in several key domains addressed by the educational intervention (Table 4). Based on responses to
Confidence related to treatment decisions across therapeutic areas was assessed among workshop participants and non-participant controls. Participants rated themselves as most confident managing patients with atherosclerosis, osteoporosis and multiple comorbidities in general. However, when confidence levels were compared across participants and non-participant controls, no significant differences were observed (data not shown).

Workshop participants identified several significant barriers to managing patients with multiple comorbidities (Table 5) that focused on the multiple medications often required to manage multiple conditions, including medication cost, complicated treatment regimens that may negatively affect medication adherence and drug–drug interactions caused by polypharmacy. Another significant barrier reported was a lack of time to address multiple comorbidities, which could potentially affect patient understanding of the disease and treatment adherence.

Effect-size analysis determined a 27% non-overlapping difference in evidence-based treatment decisions made by workshop physician participants and non-participant controls, suggesting that physicians who participated in the Complex Cases in Primary Care workshop series were 27% more likely than non-participants to apply available evidence and guideline recommendations in practice.

Online case-study outcomes
Participants demonstrated statistically significant and substantial improvements in knowledge as assessed

Table 2  ‘Complex’ case example

| Case scenario 1: 67-year-old woman with long-standing RA and osteoarthritis who experienced an MI 5 months ago |
|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|
| Clinical topics | Clinical standards cited | Take-home messages for participants |
|-----------------|--------------------------|-----------------------------------|
| Secondary prevention of CV events | AHA/ACCF Secondary Prevention Guidelines (7,8) ACCF/AHA UA/NSTEMI Guidelines (9) | CV risk reduction after an MI requires a multifaceted approach Patients engaged in self-care have better medication adherence |
| CV risks of NSAIDs | Systematic meta-analysis of randomised controlled trials of CV outcomes associated with NSAIDs (10) | Different NSAIDs are associated with varying CV risks |
| Evaluation of RA disease activity | DAS28, RAPID3 (11) | Adequate RA control contributes to CV risk reduction and improves pain associated with high disease activity |
| Chronic pain management | ACR Subcommittee on Osteoarthritis Guidelines (13) WHO Analgesic Ladder (14) | Optimal pain management requires ongoing assessment and stepwise treatment with pharmacological and non-pharmacological strategies |

Table 3  Follow-up survey respondent demographics

| Degree type | Workshop participants n = 62 | Non-workshop participants n = 50 |
|-------------|-----------------------------|----------------------------------|
| MD          | 92%                         | 82%                              |
| DO          | 8%                          | 18%                              |
| Specialty   |                             |                                  |
| Family practice | 43%                         | 46%                              |
| Internal medicine | 55%                        | 54%                              |
| Other       | 2%                          | 0%                               |
| Practice location |                           |                                  |
| Urban       | 56%                         | 48%                              |
| Suburban    | 42%                         | 48%                              |
| Rural       | 2%                          | 4%                               |
| Years since medical school graduation | 24 | 25 |

ACCF, American College of Cardiology Foundation; ACR, American College of Rheumatology; AHA, American Heart Association; CV, cardiovascular; DAS, Disease Activity Score; MI, myocardial infarction; NSAID, non-steroidal anti-inflammatory drug; RA: rheumatoid arthritis; RAPID3, Rheumatology Assessment Patient Index Data; UA/NSTEMI, unstable angina/non-ST-elevation myocardial infarction; WHO, World Health Organization.
by survey questions asked before and immediately following the enduring case-study activities associated with this initiative. Significant knowledge gains \((p < 0.001)\) were observed on 17 of 18 assessment questions that addressed all therapeutic areas. The exception was for a single item in the module addressing optimal management strategies for a patient with ADHD (data not shown).

### Discussion

A series of highly interactive and practical educational activities, centred on realistic patient case scenarios developed by a team of primary care physicians in collaboration with subspecialists, explored the many challenges associated with managing multiple comorbidities in the primary care setting. Participants of both the live and online components of this series demonstrated significant, positive gains in knowledge, confidence and competence. Because of the realistic application to practice focus of the activity content, learning gains can be immediately conveyed to routine practice and contribute to improvements in patient outcomes.

Primary care physicians who participated in the live workshops that were team-taught by primary care faculty were 27\% more likely than their non-participant peers to provide evidence-based care to their patients. The most significant differences between workshop participants and non-participant controls were observed for clinical topics not encountered in the primary care setting on a daily basis (i.e. RA, OAB), a finding that suggests the live educational series helped address important practice gaps relating to less commonly encountered conditions for participating physicians.

Several elements of this initiative contributed to its success. First, interactive, ‘hands-on’, case-based CME activities offer topic-specific small-group breakout sessions, extensive opportunities to interact with primary care-faculty experts and the chance to practice new skills with instant feedback and postcourse follow-up; presenting state-of-the-art care through this case-based learning rather than through traditional didactic lectures has been proven to be an effective means for educational interventions and learner retention (5). An emphasis on small-group interactions with peers, in which learners develop and debate management plans for specific patient scenarios, enhances key elements of adult learning principles such as interactivity, practicality and goal-oriented discussions.

Second, case vignettes, which were used in the follow-up assessment for this series, have gained considerable support for their value in predicting actual physician practice patterns. Furthermore, when compared with other established methods, such as retrospective chart reviews or standardised patients, case vignettes are more cost-effective and less invasive than other means of measurement (15,16).

Third, delivering educational activities via the Internet is a popular, effective approach that is increasingly used in the CME arena. This platform provides

| Clinical topic                                      | Workshop participants* \(n = 50\) (%) | Non-participants \(n = 50\) (%) | p-value |
|----------------------------------------------------|--------------------------------------|----------------------------------|---------|
| Recognition of medications that contribute to OAB symptoms | 36                                   | 18                               | 0.043   |
| Appropriate referral of patients with RA           | 57†                                  | 36                               | 0.035   |
| Appropriate evaluation of patients for osteoporosis| 61†                                  | 42                               | 0.056   |
| Recognition of improved health outcomes with cardiac rehabilitation | 68                                   | 50                               | 0.067   |
| Diagnosis of ADHD in adolescent patients           | 69†                                  | 52                               | 0.179   |
| Comprehension of challenges faced by adolescent patients with T2DM | 74                                   | 62                               | 0.198   |

ADHD, attention deficit hyperactivity disorder; OAB, overactive bladder; RA, rheumatoid arthritis; T2DM, type 2 diabetes mellitus.

*Based on 30-day follow-up survey responses; †n = 49.

| Barrier                                      | Workshop participants \(n = 62\) (%) |
|----------------------------------------------|-------------------------------------|
| Cost of multiple medications                 | 74                                  |
| Adherence to complicated treatment regimens  | 68                                  |
| Insufficient office time for patient education| 63                                  |
| Potential for drug–drug interactions         | 61                                  |
| Inability of primary care offices to manage patients with multiple comorbidities | 27                                  |
Complex cases in primary care with multiple chronic conditions are abundant of data available from controlled clinical trials; this is mainly because of the single disease state with expert faculty representing performance (19,20). Furthermore, combining online didactic learning with case-based challenges increases the effect of the intervention on facilitating changes in clinician performance (19,20).

Traditionally, certified CME activities focus on a single disease state with expert faculty representing one clinical specialty; this is mainly because of the abundance of data available from controlled clinical trials. However, these trials usually exclude patients with multiple chronic conditions—the very patients most likely to present to a primary care practice. Because these patients rarely fit the profile of clinical test subjects, the inherent difficulty in treating patients with comorbidities is often overlooked while clinicians are challenged to apply the findings from these trials. For example, a specific treatment approach for one illness may exacerbate a comorbid condition; similarly, optimal management decisions for a particular disease may be contingent on other patient-specific factors or concurrent medications. If clinicians are to truly improve their practice of evidence-based medicine, they must be provided with education that focuses on realistic patient scenarios presented in the context of significant system-based practice challenges that are commonly encountered in contemporary primary care offices. Furthermore, the credibility and relevance of the information presented are enhanced when primary care physicians who practice in this setting lead the content development. Finally, it is clear that not all clinicians have readily accessible specialty consultants, who are vital in certain circumstances. For example, the inability to secure a timely rheumatology consult for cases of suspected RA makes it imperative that primary care clinicians be comfortable with initiating treatment early in the disease course, as this is known to improve outcomes.

Primary care physicians need to keep up-to-date on a vast array of information. Based on the results of the workshop follow-up surveys, future education is needed specifically in the initial evaluation and treatment of OAB, treatment guidelines for ADHD, treatment considerations for patients with chronic pain (including minimising the risk of diversion and abuse) and knowledge and management of potential drug-drug interactions encountered in patients with multiple comorbidities. Furthermore, challenges remain with patient adherence relating to polypharmacy, medication costs and insufficient time for patient education.

The limitations of this study include the assumption that observed improvements in knowledge, confidence and competency are able to be directly converted into meaningful actions that result in higher quality patient care. Furthermore, bias may have been introduced into the follow-up survey responses. Although randomly selected and demographically similar to workshop participants, the non-participant control group may not have been an accurate match to the workshop participants in terms of previous knowledge and training. Finally, workshop participants may have been more motivated than non-participant controls, as they were self-selected with a presumably greater interest in the care of patients with multiple chronic conditions and may have received further education between attending the workshop and completing the follow-up survey.

Participation in an educational series that was developed by primary care clinicians in collaboration with specialist consultants and focused on the treatment and management of patients with multiple chronic conditions was associated with gains in participant knowledge, confidence and competency. In addition, further educational needs and persistent practical challenges were identified, including issues surrounding adherence, medication costs and patient education, which need to be addressed by future interventions. Multiple chronic comorbidities affect a large number of Americans, and care for these patients is complex. Yet, education on how to treat these complicated patients is lacking. With the use of clinically relevant, complicated case scenarios, physicians can learn how to better apply evidence-based medicine, which, in turn, may result in improved patient outcomes.

Acknowledgements

This study was supported by unrestricted educational grants from Abbott Laboratories; Astellas Pharma Global Development, Inc; Lilly USA, LLC; Purdue Pharma L.P.; Genentech and Biogen Idec; and a partnership between Kowa Pharmaceuticals America, Inc. and Lilly USA, LLC. The funding sources had no role in the content development for the educational activity or in the execution, analysis or development of the resulting manuscript associated with this study.

The authors thank Martha Inglis-LeGall for project management; Beth Wills for participant recruitment;
Kenny Khoo for data management; Stephen Burton for workshop data analysis; Amy Sison, Kristin Hartman, and Mary Catherine Downes for online case-study outcomes management; Be’Ledda Dixon for CME co-ordination; Carolyn Berry and Maggie Paul for assistance with online case-study data analysis; and Rebecca Julian and Lisa Rinehart for editorial assistance.

Author contributions
Concept/design: Andolsek, Rosenberg, Gardner; Data analysis/interpretation: Abdolrasulnia, Stowell, Gardner; Drafting article: Gardner, Stowell; Critical revision of article: Andolsek, Rosenberg, Abdolrasulnia; Approval of article: Andolsek, Rosenberg, Abdolrasulnia, Stowell, Gardner.

References
1 Partnership for Solutions, Johns Hopkins University. Chronic conditions: making the case for ongoing care. http://www.partnershipforsolutions.org/DMS/files/chronicbook2004.pdf (accessed September 2012).
2 Kung HC, Hoyert DL, Xu IQ, Murphy SL. Deaths: final data for 2005. Natl Vital Stat Rep 2008; 56: 1–120.
3 Benjamin RM. Multiple chronic conditions: a public health challenge. Public Health Rep 2010; 125: 626–7.
4 Vogeli C, Shields AE, Lee TA et al. Multiple chronic conditions: prevalence, health consequences, and implications for quality, care management, and costs. J Gen Intern Med 2007; 22(Suppl. 3): 391–5.
5 Moore DE Jr, Green JS, Gallis HA. Achieving desired results and improved outcomes: integrating planning and assessment throughout learning activities. J Contin Educ Health Prof 2009; 29: 1–15.
6 Cohen J. Statistical Power Analysis for the Behavioral Sciences, 2nd edn. Hillsdale, NJ: Lawrence Erlbaum Associates, 1988.
7 Moore DE Jr, Green JS, Gallis HA. Achieving desired results and improved outcomes: integrating planning and assessment throughout learning activities. J Contin Educ Health Prof 2009; 29: 1–15.
8 Smith SC, Allen J, Blair SN et al. AHA/ACC guidelines for secondary prevention for patients with coronary and other atherosclerotic vascular disease: 2006 update. Circulation 2006; 113: 2363–72.
9 Anderson JL, Adams CD, Antman EM et al. 2011 ACCF/AHA focused update incorporated into the ACC/AHA 2007 guidelines for the management of patients with unstable angina/non ST-elevation myocardial infarction: a report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. Circulation 2011; 123: e426–579.
10 Trelle S, Reichenbach S, Wandel S et al. Cardiovascular safety of non-steroidal anti-inflammatory drugs: network meta-analysis. BMJ 2011; 342: c7086.
11 Ringold S, Singer NG. Measures of disease activity in rheumatoid arthritis: a clinician’s guide. Curr Rheum Rev 2008; 4: 259–65.
12 Visual DAS28 Calculator. http://www.4s-dawn.com/DAS28/DAS28.html (accessed January 29, 2013).
13 American College of Rheumatology Subcommittee on Osteoarthritis Guidelines. Recommendations for the medical management of osteoarthritis of the hip and knee. Arthritis Rheum 2000; 43: 1905–15.
14 Vargas-Schaffer G. Is the WHO analgesic ladder still valid? Twenty-four years of experience. Can Fam Physician 2010; 56: 514–7.
15 Peabody JW, Luck J, Glassman P, Dresselhaus TR, Lee M. Comparison of vignettes, standardized patients, and chart abstraction: a prospective validation study of 3 methods for measuring quality. JAMA 2000; 283: 1715–22.
16 Peabody JW, Luck J, Glassman P et al. Measuring the quality of physician practice by using clinical vignettes: a prospective validation study. Ann Intern Med 2004; 141: 771–80.
17 Curran VR, Fleet LJ, Kirby F. A comparative evaluation of the effect of Internet-based CME delivery format on satisfaction, knowledge and confidence. BMC Med Educ 2010; 10: 10.
18 Fordis M, King JE, Ballantyne CM et al. Comparison of the instructional efficacy of Internet-based CME with live interactive CME workshops: a randomized controlled trial. JAMA 2005; 294: 1043–51.
19 Davis DA, Mazmanian PE, Fordis M, Van Harrison R, Thorpe KE, Perrier L. Accuracy of physician self-assessment compared with observed measures of competence: a systematic review. JAMA 2006; 296: 1094–102.
20 Casebeer L, Andolsek K, Abdolrasulnia M et al. Evaluation of an online bioterrorism continuing medical education course. J Contin Educ Health Prof 2006; 26: 137–44.

Supporting Information
Additional Supporting Information may be found in the online version of this article:
Data S1. Workshop Outcomes Survey A.
Data S2. Workshop Outcomes Survey B.

Paper received December 2012, accepted March 2013