

Case Competitions: a New Frontier in Inter-Professional Health Education?

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Abstract

Background: Case Competitions (CCs), an educational approach borrowed from business schools, feature interprofessional teams of students working collaboratively to “solve” a simulated challenge. They present their recommendations to expert judges and win prizes. There is a proliferation across the US of CCs focused on health themes. No literature exists to document this trend. We set out to explore and map this activity across North America, and to review the judging rubrics.

Methods: We identified health-oriented CCs in the US by searching the medical and grey literature using key words: “case competition” and Health; “Case challenge” and Health. CCs were categorized based on location, organization, content area, process, prizes, and year of initiation. Scoring sheets were analyzed for areas of assessment.

Results: The number of health-related CCs is increasing. There are currently >30 CCs in the US, with dozens of universities competing. The majority were initiated in the past 5 years. Judging rubrics focused on several domains: understanding and analysis of problem; content and justification for solution; presentation, responsiveness to questions; process characteristics (e.g. teamwork).

Conclusion: CCs represent unique opportunities for interprofessional learning. There are no studies to assess CCs effectiveness as an educational activity. Educators should explicitly define CCs goals and objectives, adapt assessment tools and evaluate associated outcomes.

Keywords: Interprofessional education, case competitions, case challenges, interdisciplinary education, experiential learning.

Article

Background

Various pedagogical methods have been developed in recent decades meant to engage health profession students in student-centered, collaborative, inquiry-based learning. Among them are activities such as case-based learning, problem-based learning, and team-based learning [1, 2, 3]. While most of these strategies have been confined to learning within one’s own discipline, another emerging and expanding activity in health-profession education emphasizes ‘interprofessional’, ‘interdisciplinary’ and ‘multi-disciplinary’ training and education. According to the World Health Organization (WHO), Interprofessional Education or

Learning, known as IPE or IPL, is an experience that “occurs when students from two or more professions learn about, from, and with each other” [4]. It has a stated-goal of promoting better collaboration in healthcare teams, which, in turn, is surmised to impact patient outcomes and more efficient use of resources. [5,6]. Though IPE has been endorsed globally, its impact on learners and systems is mixed [7,8].

Case Competitions, or Case Challenges (CCs), a concept originating at business schools, feature teams of students who work collaboratively to analyze a simulated or real-world challenge and create solutions. In general, students in groups of 4-6, representing various disciplines (such as medicine, public health, nursing, business, law, health systems research), and different levels of training (undergraduate, graduate, doctoral), are given a case. Their goal is to develop an innovative solution (given, usually, up to one week), and then present their interdisciplinary approach to a panel of expert judges. Thus, CCs are potentially an important means for health profession students (and others) to engage in IPE.

CCs borrow elements from several common educational strategies such as Problem-based learning (PBL), Case-based learning (CBL) and Team-based learning (TBL). They represent unique opportunities for interprofessional and inter-disciplinary learning for health professional students. They also provide experiential learning, a key element of IPE, which calls for students to enter “a practice environment to better understand how to work collaboratively in “real-life” situations,” (4).

Anecdotal information suggests CCs are becoming popular in health profession education. However, less than a handful of articles mention this educational activity in professional medical, health or education journals. The first mention of CC in the medical literature describes the CLARION competition [9]. In 2011, an article in *The Lancet* described one of the most popular global health case competition at Emory University [10]. More recently, an article the *American Journal of Public Health* mentioned CCs at a university in Memphis, Tennessee as an “innovation in public health education” [11].

There are no additional mentions of CCs in the literature, or any systematic documentation of this trend as an educational activity. Having served as faculty leaders (RM and AR) of university teams competing in an international case competition, and as founders (all authors) of a regional public health case-competition our aims were twofold: 1) to provide an initial description of the ‘playing field’ and describe the trend, 2) to review the judging rubrics used by several organizers.

Methods

We conducted a literature search (July 2013 – February 2014) via PubMed, as well as the grey literature through Google, for health-science related CCs, using the following key words: “case competition” and “health”; “case challenge” and “health”. The search was repeated several times during this time period, and independently by two of the authors (RM and AH), to make sure new CCs were included.

Two authors (RM and AH) then reviewed the web-sites of the specific competitions to extract information about location, organization, content area, process and prizes, year of initiation. We contacted the administrator of each competition to obtain missing information and to request judging rubrics.

Of the 33 competitions that we contacted requesting rubrics, seventeen shared the information with us. Four competitions used the same rubric developed by the CLARION competition⁹, and two used the rubric devised for the Emory Global Health Case Competition [10]. All authors independently assessed and compared the content of a total of thirteen unique rubrics. Consensus was reached following a group discussion.

Results

A. Case Competition Overview and Distribution

We identified 36 CCs, of which 33 were specifically focused on health and subsequently included in our descriptive analysis. Three were considered to have themes that were not as relevant (business, ethics, consulting) and were therefore dropped.

The geographical distribution of CCs favors the eastern part of the United States (Figure 1).

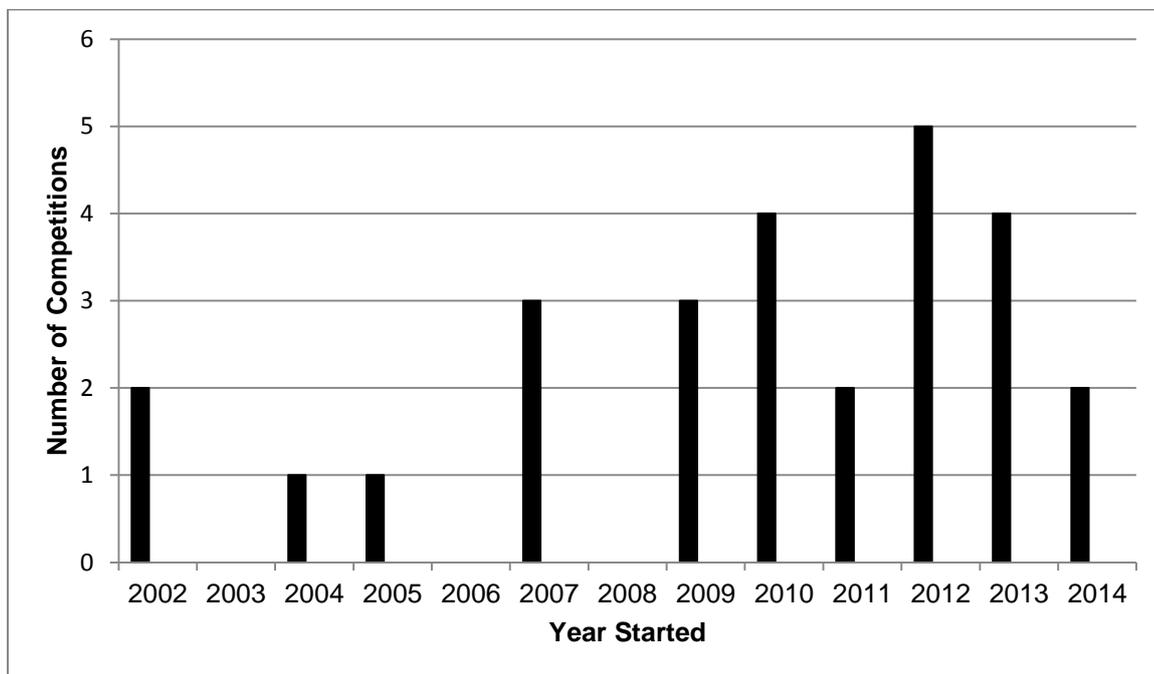
Figure 1: Geographic distribution of CCs



The number of CCs has increased since the first description in 2002 (Figure 2), with more than twenty programs initiated in the past five years alone.

Figure 2: Case competitions by year of initiation*

*Only 27 cases are included as five CC did not provide their year of initiation and one CC began earlier than 2002.



CCs tend to be annual and cover a wide variety of health-related content areas, from Global Health, to health policy, quality and safety, community health, health administration, among others. Global Health is the most popular topic, with one-third of competitions devoted to it (11 out of 33 programs, or 33%). Table 1 gives a summary of the active CCs we identified.

Table 1: Compilation of Health Profession Case Competitions

*Unique competition rubric received

**Competition used CLARION Interprofessional Team Case Competition: A Systems-Based Practice Rubric

***Competition used Emory Global Health Case Competition Rubric

§ Information could not be obtained by the time of submission despite multiple (>3) attempts

Name of Competition (*indicates rubric received)	Frequency, year started	General topic	Who can participate?	Organizer	Prize
*1. A.T. Still University's Interprofessional Education Collaboration Case Competition	Annual, 2012	Clinical case studies	Anyone in a health profession or discipline (dentistry, health science, nursing, occupational therapy, osteopathic medicine)	ATSU (an osteopathic medicine school)	Monetary prizes (unspecified amount)
*2. Boston University Global Health Sector Interdisciplinary Case Competition	Annual, 2012	Health sector market and medical devices in the global health sector	Interdisciplinary (MBA students, along with students from Schools of Public Health, Medicine, Engineering and/or Law, 2/4 team members must be in the MBA program)	Boston University School of Management	1 st place: 20,000 2 nd place: \$7,500 3 rd place: \$5,000
*3. Canadian Evaluation Society/Canadian Evaluation Society Educational Fund (CES-CESEF) Evaluation Case Competition	Annual, 2002	Community engagement and health	Interdisciplinary – students from any discipline can participate	CES-CESEF	Three finalist teams receive a small gift of \$50 value and certificate. The winning team has names engraved on a plaque
**4. CLARION Interprofessional Team Case Competition: A Systems-Based Practice – LOCAL	Annual, 2002	Quality and patient safety in Healthcare	Interdisciplinary – at least two different professions have to be represented	Student organization through the Academic Health Center in the Office of Education	Monetary prizes (unspecified amount)
**5. CLARION Interprofessional Team Case Competition: A Systems-Based Practice – NATIONAL	Annual, 2005	Quality and patient safety in Healthcare	Interdisciplinary – at least two different professions have to be represented	Student organization through the Academic Health Center in the Office of Education	Monetary prizes (unspecified amount)

6. Dartmouth Global Health Case Competition	§	Global Health	Interdisciplinary – students in any discipline can participate	Thayer, Tuck, TDI, TDC, DCGH, Dickey, Tucker	Winning group has the opportunity to implement their solution
7. Allegheny County's Department of Human Services Local Government Case Competition	Annual, 2007	Human services delivery	Interdisciplinary --- Students enrolled in graduate programs pertaining to public policy, social work, non-profit management, public administration, business, law or other related fields	Allegheny County Department of Human Services (DHS)	First place: \$3,000 Second place: \$1,500 Third place: \$500
***8. Emory Global Health Case Competition - INTERNATIONAL	Annual, 2010 included teams from the USA, 2012 included international teams	Global Health	Interdisciplinary – students in any discipline can participate but multiple disciplines must be represented	Emory Global Health Institute	First place: \$6,000, second place: \$3,000, third place: \$1,500. Honorable Mention and Participant Choice Award prizes were \$900 each. The Innovation Award prize was \$600.
***9. Emory Global Health Case Competition – Internal	Annual, 2009	Global Health	Interdisciplinary – students in any discipline can participate but multiple disciplines must be represented	Emory Global Health Institute	\$3,000 and the chance to compete in the Emory International Competition
10. Everett V. Fox National Case Competition	Annual, 1996	Health administration, business administration and public health	Graduate Programs in Health Administration, Business Administration and Public Health	National Association of Health Services Executives (NAHSE)	Awards of \$85,000 were given
11. Harvard's International Development Conference	Annual, Year started §	International Development	Interdisciplinary – students in any discipline can participate	School of Government	§
12. Health Care Executives of Southern California College Bowl	Annual, Year Started §	Healthcare administration	Interdisciplinary, master's level primarily	Health Care Executives of Southern California, which is the southern	§

				California chapter of the American College of Healthcare Executives	
*13. Columbia's Healthcare Delivery and Management Case Competition	Annual, 2007	Healthcare delivery and management	Graduate students completing the following degrees: MPH, EMPH, PTM, MBA, EMBA, MIA, MPA, MD	Columbia Mailman School of Public Health	First place: \$250 per person, 2nd place: 150 per person, third place: \$100 per person
14. Healthcare Management Association's Healthcare Case Competition	Annual,	Business problems facing Canada's healthcare system	MBA students	Rotman School of Management	\$
15. Hult prize	Annual, 2009	Combining business with solving global health problems	Interdisciplinary (all participants must come from the same school but can be in any undergraduate, graduate, PhD or other program)	Hult International Business School Partnership with the Clinton Global Initiative	\$1 million dollars – winners use part of their prize to implement their solution
16. Humana Healthcare Case Competition	Annual, 2011	Business solution to a Healthcare challenge	Interdisciplinary, must be graduate students	Not affiliated with a school	First place: \$10,000 and interviews with a Humana Infusion recruiter, Second place: \$5,000 and the same interviews as first place, Third-Eighth place: \$1,000
**17. Interprofessional Healthcare Case Competition	Annual, 2014	Receive a case study and teams must analyze the interdisciplinary efforts	Interprofessional - at least 3 health professions/majors represented within each team.	Wisconsin AHEC (Area Health Education Centers)	1st place \$3,000, 2nd place \$2,000, 3rd place \$1,000
*18. District of Columbia Regional Public Health Case Competition	Annual, 2013	Public Health	Interdisciplinary – students from any discipline	Institute of Medicine / Georgetown University	1 st place \$1000 2 nd place \$500 3 rd place \$250 Creativity and

					innovation \$200 Best interdisciplina ry approach \$200
19. Kellogg Biotech and Healthcare Case competition	Annual, 2004	Biotechnology, healthcare	Teams of Graduate students, where at least two have to be in MBA programs	Kellogg School of Management	First place: \$5,000
20. Medtronic Interdisciplinary Healthcare Case Competition	Annual, 2009	Healthcare and medical device industry	Graduate students in the fields of law, medicine, public policy, public health, and business	Carlson School of Management	\$4000 to winning team, \$2000 second place, \$1000 third place
21. Massachusetts Institute of Technology Sloan Healthcare Case Competition	§	Healthcare	Interdisciplinary with at least 2 MBA students	Sloan School of Management	First place: \$4,000 Second place: \$1,600
22. North Carolina State University	Annual, 2010	Global Health	Interdisciplinary	An organization called the Global Health Initiative at NCSU through the Office of International Affairs	1st Place: \$1500 2nd Place: \$500 3rd Place: \$500
*23. Northwestern University Global Health Case Competition	Annual, 2014	Global Health	Interdisciplinary – students in any undergraduate or graduate program, but there must be three schools represented on each team	Northwestern University Feinberg School of Medicine Center for Global Health	1st place: \$1000 and all fees associated with competing in the Emory competition; 2nd place: \$600
24. Ohio State Healthcare Management Case Competition	Annual, 2013	Healthcare management / administration	First year MHA/MBA/MPA students	Health Administration	§
*25. South Florida Healthcare Executive Forum (SFHEF) Student Case Competition	Annual, 2012	Healthcare management / administration	Interdisciplinary – students in any undergraduate or graduate program	South Florida Healthcare Executive Forum, an Independent Chapter of the American College of Healthcare	\$1000 for first place, \$750 for second place and \$500 for third place

				Executives	
*26. Triangle Case Competition	Annual, 2010	Global health	Interdisciplinary (at least 3 disciplines required)	Interdisciplinary – students from any discipline	§
*27. University of Alabama at Birmingham Health Administration Case Competition	Annual, 2007	Health Administration	Inter-professional Each team comprised of 2-3 students enrolled in a Commission on Accreditation Healthcare Management Education (CAHME) accredited health-administration graduate program.	Department of Health Services Administration	\$3,000 per team member
**28. University of New England Interprofessional Case Competition	Annual, 2012	Medical – students are given a patient case study that went wrong that they must analyze	Interprofessional- Any full time health profession student, with no more than 2 students from the same profession (Ex: dental school, nursing, OT, MD, public health)	IPSAT is not affiliated with one college or program but rather embraces the collaboration model taught and promoted by our Center for Excellence in Interprofessional Education.	First place: \$3,000 and the opportunity to compete in University of Minnesota’s CLARION competition.
*29. University of Minnesota Global Health Case Competition	2013	Global Health	Graduate (masters and doctoral level), professional, and upper-level undergraduate students from any discipline	Center for Global Health and Social Responsibility and the Center for Health Interprofessional Programs	Winning team gets sent to Emory and receives \$500, second place receives \$300 and third place receives \$200
30. University of Southern California Global Health Case Competition	Annual, 2012	Global health	Interdisciplinary – students in any discipline	Keck School of Medicine partnering with the CDC	Winning team represents USC at the Emory competition as well as small CDC gifts (t-

					shirts, pens)
31. University of Virginia Global Health Case Competition	Annual, 2013	Global Health	Interdisciplinary – students in any discipline	UVA’s Center for Global Health	First place: \$1,200 and the chance to compete at the Emory Competition
*32. Vanderbilt Global Health Case Competition	Annual, 2011	Global health	Interdisciplinary – students in any discipline (undergraduate, graduate or professional)	Vanderbilt Institute for Global Health	Winning team goes to the Emory Case Competition, money is donated to a charity of choice - 1st place: \$500, 2nd place: \$250, 3rd place: \$100
33. Wake Forest University Biotechnology Conference	Annual, 2010	Medical, pharmaceutical, law and business students	Interdisciplinary (Business, law, science and medical students)	Wake Forest University Schools of Business	First place: \$10,000 Second place: \$5,000 Third place: \$2,000 Honorable mention: \$500

B. Review of Judging Rubrics

A majority of the reviewed rubrics provided categories for assessment and almost all allotted a certain number of points or a weight to each category. The team with the highest total point value won the competition. The categories evaluated included:

- Understanding the Challenge (How well did the group handle the subject matter provided in the case?): Judges evaluated this based on whether the teams accurately identified the target population, gaps in services, and social or systemic factors contributing to the problem.
- Solution content and justification (How did teams justify the feasibility and effectiveness of their solutions?): Solutions were judged by the evidence for likely effectiveness, financial feasibility, cultural sensibility, and sustainability. Identifying and serving the population with empathy was an important factor when judging solution viability, as were budget limitations, time and resource constraints.
- Responsiveness to judges’ questions (How well-prepared were students to answer judges’ questions?): Teams that fumble or cannot justify a solution receive a low score, while high-ranking presenters anticipate flaws in their arguments and are prepared to justify their claims with confidence and poise.
- Presentation (How confident and effective were students in their delivery?): Style and delivery also contribute to the overall score. Practiced, polished speakers tend to be more persuasive than those who stumble over their words or read from slides. Clear, engaging presentations are viewed as more professional and therefore awarded higher scores.
- Process and Development (How well did the team work together on the case?): Creativity, resourcefulness, and teamwork also factor into judging scores. If judges are able to tell that a team did

not work well together—for example, if students do not fluidly transition from one speaker to the next—then the overall quality of the presentation drops and students receive lower marks. Further, students who reach out to established organizations to research current services or to receive input on their solutions are viewed favorably when compared to those who did not.

Only two of the rubrics we had access to (2/17 or 11%) had a unique category to assess team work.

Discussion

The number of CCs focused on health has increased over the past 5 years to include more than 30 unique competitions – tallied through February 2014 -- across the US, representing a growing trend in IPE.

However, despite their apparent growing popularity, case competitions have not been reviewed methodologically: there are no known published educational goals and objectives for learners, no published assessment tools or clearly defined outcomes for learners or for the health system.

This article is the first known attempt to quantify and describe this educational activity. It is meant to draw attention to this educational innovation and to urge educators to apply the same critical and rigorous appraisal processes to evaluate its effectiveness and impact, as those used to assess PBL, CBL and IPE activities in general.

As educators and organizers, we must be able describe the desired educational end-point of the CC experience, develop a set of learning goals and objectives, corresponding outcomes measures, as well as rigorous assessments tools for intended outcomes. Various frameworks exist to classify IPE learning outcomes on the micro level (learner or participant), as well as the macro level (health system) [12,13,14,15, 16]. Some of the IPE frameworks may be suitable for adaptation in CC evaluation, particularly those that put the learner at the center.

It is also important to ground CCs in learning theory. From an individual learner's perspective, because they require deep engagement with the material, CCs fulfill most of the tenets of Bloom's taxonomy (17). Not only do CCs require the participants to achieve mastery of material at lower Bloom's levels (*remember* and *understand*), they also require the ability to *apply*, *analyze*, *evaluate* and *create* -- higher Bloom's level mastery. Participants need to quickly master *factual knowledge*, but also master *conceptual* and *procedural knowledge* in order to generate a comprehensive and creative solution to a complex multi-factorial problem.

Another taxonomy that may be useful as a framework to assess the impact of CCs on the learner is one developed by Fink (18). This taxonomy incorporates different kinds of learning: *Foundation Knowledge*, which provides the bases necessary for the other types of learning; *Application*, in which participants put their new-found knowledge to use; *Integration*, which occurs when participants discover underlying connections between different elements of their knowledge; *Human Dimension*, where participants see that their work has led to a personal growth, and finally, *Caring*, which occurs when students deeply engage in a learning activity, and become passionate about it.

However, if CCs are viewed through a prism of IPE, particular efforts should be made to assess and measure knowledge, skills and attitudes related to interprofessional collaboration. Educators, administrators and organizers of CCs must develop tools that measure the processes and outcomes related to collaborative competencies and team work. Key determinants of collaborative practice may include: 1) learners' understanding of the roles and responsibilities of team members, 2) communication and reflection skills and behaviors, 3) attitudes about teamwork, trust, and respect. [19,20, 21, 22].

Teamwork was conspicuously missing from most of the scoring rubrics we assessed. An exploration of scoring rubrics revealed few additional challenges that help shed light on the complexity of assessing learning in the context of case competitions.

1. Teamwork

CCs can be valuable for learning how to work in teams. In our experience, the most effective teams were those in which the participants recognized that each member of the team has unique contributions to make, that the role of the titular “captain” is to make sure all voices were heard – not to steer the discussion in a particular direction, and that all the members respect each other.

Teamwork is a major IPE component. However, very few CCs scoring sheets included this as a unique category. Further, assessing team work accurately and methodologically is challenging given the use of the final presentation as the sole evaluation of student performance and student learning. Although there are taxonomies/rubrics that evaluate teamwork, there is no single agreed-upon standard in the same way that most educators find Bloom’s taxonomy relevant.

Possible solution: develop or adopt validated rubrics that have expanded criteria for teamwork.

2. Process Evaluation

The format makes it difficult to judge the intangible skills that individual team members use as they develop their case solution and presentation. During the case challenge, judges only see the final product but are asked to make inferences about the process and skills used to develop it (e.g., teamwork, creativity, resourcefulness, etc.).

Possible Solution: In order to reach a better understanding, longer-term observation and assessment may be needed. While this may not be feasible for a competition, adopting or embedding the CC model within a broader educational experience – such as more longitudinally during the school year -- may be beneficial to students, and more appropriate to achieve educational objectives. It may provide an opportunity to have an ongoing inter-disciplinary engagement, foster a deeper opportunity for reflection, and afford the faculty a more robust assessment of student performance on competencies not easily observed during the one-time approach.

3. Judges’ Inter-rater reliability.

Judges – often volunteering only for a few hours – have a short time to familiarize themselves with the rubric, potentially making the assessment superficial and one-dimensional. Their individual gauge for what constitutes a “6” or a “10” may fluctuate throughout the day, introducing the risk of, for example, first-impression or recency biases. Furthermore, numbers will have different meanings across judges—one judge’s 5 may be another’s 7.

Possible Solution: Instituting a qualitative and facilitated judging process, in which a moderator guides judges through a consideration of various criteria to help them arrive at a consensus decision. In this approach, judges could still be given categories to consider as they view the presentations, but rather than assigning numerical rating to these categories, they might instead use a broad categorical scale to assess performance (e.g. poor, average, good, outstanding). Rather than determining a winner primarily by summing points, the moderator could help ensure that judges sufficiently reflect upon and discuss each team’s strengths and weaknesses, and, when necessary, help judges remember presentation aspects that they otherwise might have forgotten. Some of the competitions described here already incorporate a discussion period into the judging process; our review of the rubrics did not assess the extent to which this was done, the methods that were used, or the extent to which the outcomes of the discussions could influence the numerical score rankings.

4. Scoring methods.

A team’s overall performance is not necessarily equal to the sum of their scores in individual categories. Thus, it is unclear whether the best way to determine the winner is by the highest point score summed across different categories.

Possible Solution: The selection of winners in different categories, rather than by ranking them 1st, 2nd or 3rd overall. Teams could be given prizes for having, for example, the overall best solution, the most feasible solution, the most creative one, or for being the most resourceful team. This approach may more

comprehensively reflect the value of the different skills and competencies that contribute to inter-professional practice.

Our study has several limitations. Firstly, it is likely that we missed a few CCs that launched after our study period and that our list is not comprehensive. We also did not include CCs outside of the United States, although we know they exist. Secondly, our study is merely descriptive and as such lacks detail that would allow us to understand the process in more depth.

In summary, the use of CCs is emerging as a trend which is aligned with concepts in interdisciplinary and interprofessional education. However, there are no agreed-upon educational objectives for this activity, no common framework for designing and implementing these case challenges, nor is there a common framework for evaluation of this as an educational tool. In particular, there are some disconnects between evaluating the process (the interprofessional skills being employed by the teams) and evaluating the product (the final presentation the judges see).

Additionally, there are no studies yet looking into whether these CCs contribute to better long-term outcomes in the knowledge, skills, practice and future career trajectories of the participants. Qualitative surveys of students, organizers, and judges may provide important information about the process and the desired outcomes. A longitudinal assessment of participants' competencies, knowledge and attitudes may help shed light on attainment of educational objectives. The input of experts in assessment and evaluation will be extremely valuable.

Despite these challenges, we believe CCs represent an opportunity to engage diverse groups of students in a lively activity, enhance and expand IPE beyond the classroom, the school, or the institution.

Declaration of Interest

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References

1. Russell AT, Comello RJ, Wright DL. "Teaching Strategies Promoting Active Learning in Healthcare Education." *Journal of Education and Human Development*. Volume 1, Issue 1. 2007.
<http://www.scientificjournals.org/journals2007/articles/1025.htm>. Accessed April 30, 2015
2. Spencer, John A, and Reg K Jordan. "Learner Centred Approaches in Medical Education." *BMJ : British Medical Journal* 318, no. 7193 (May 8, 1999): 1280–83.
<http://dx.doi.org/10.1136/bmj.318.7193.1280>
3. Fatmi, Mim, Lisa Hartling, Tracey Hillier, Sandra Campbell, and Anna E. Oswald. "The Effectiveness of Team-Based Learning on Learning Outcomes in Health Professions Education: BEME Guide No. 30." *Medical Teacher* 35, no. 12 (December 2013): e1608–24.
<http://dx.doi.org/10.3109/0142159X.2013.849802>
4. WHO Study Group on Interprofessional Education and Collaborative Practice. Framework for action on interprofessional education and collaborative practice. A publication of the World Health Organization, 2010. Available from: http://www.who.int/hrh/resources/framework_action/en/
5. Interprofessional Education for Collaboration: Learning How to Improve Health from Interprofessional Models across the Continuum of Education to Practice – Workshop Summary - Institute of Medicine, Washington, DC. Available from: <http://www.iom.edu/Reports/2013/Interprofessional-Education-for-Collaboration.aspx>
6. Frenk J, Chen L, Bhutta ZA, Cohen J, Crisp N, Evans T, et al. Health professionals for a new century: transforming education to strengthen health systems in an interdependent world. *The Lancet*. 2010 Dec;376(9756):1923–58. [http://dx.doi.org/10.1016/S0140-6736\(10\)61854-5](http://dx.doi.org/10.1016/S0140-6736(10)61854-5)
7. "Measuring the Impact of Interprofessional Education (IPE) on Collaborative Practice and Patient Outcomes: A Consensus Study." Institute of Medicine. Accessed April 29, 2015.
<http://www.iom.edu/Activities/Global/MeasuringtheImpactofInterprofessionalEducation.aspx>
8. Hammick, M., D. Freeth, I. Koppel, S. Reeves, and H. Barr. "A Best Evidence Systematic Review of Interprofessional Education: BEME Guide No. 9." *Medical Teacher* 29, no. 8 (October 2007): 735–51.
<http://dx.doi.org/10.1080/01421590701682576>
9. Johnson AW, Potthoff SJ, Carranza L, Swenson HM, Platt CR, Rathbun JR. CLARION: a novel interprofessional approach to health care education. *Acad Med*. 2006 Mar;81(3):252–6.
<http://dx.doi.org/10.1097/00001888-200603000-00010>
10. Ali, Mohammed K., Jonathan M. Grund, Jeffrey P. Koplan, and Emory Global Health Case Competition Planning Committee. "Case Competitions to Engage Students in Global Health." *Lancet* 377, no. 9776 (April 30, 2011): 1473–74. [http://dx.doi.org/10.1016/S0140-6736\(10\)62186-1](http://dx.doi.org/10.1016/S0140-6736(10)62186-1)
11. Levy, Marian, Daniel Gentry, and Lisa M. Klesges. "Innovations in Public Health Education: Promoting Professional Development and a Culture of Health." *American Journal of Public Health* 105 Suppl 1 (March 2015): S44–45. <http://dx.doi.org/10.2105/AJPH.2014.302351>
12. Thistlethwaite, Jill Elizabeth, David Davies, Samilia Ekeocha, Jane M. Kidd, Colin MacDougall, Paul Matthews, Judith Purkis, and Diane Clay. "The Effectiveness of Case-Based Learning in Health Professional

Education. A BEME Systematic Review: BEME Guide No. 23." *Medical Teacher* 34, no. 6 (2012): e421–44.
<http://dx.doi.org/10.3109/0142159X.2012.680939>

13. Hartling, Lisa, Carol Spooner, Lisa Tjosvold, and Anna Oswald. "Problem-Based Learning in Pre-Clinical Medical Education: 22 Years of Outcome Research." *Medical Teacher* 32, no. 1 (January 1, 2010): 28–35. <http://dx.doi.org/10.3109/01421590903200789>

14. Thistlethwaite, Jill, Monica Moran, and World Health Organization Study Group on Interprofessional Education and Collaborative Practice. "Learning Outcomes for Interprofessional Education (IPE): Literature Review and Synthesis." *Journal of Interprofessional Care* 24, no. 5 (September 2010): 503–13.
<http://dx.doi.org/10.3109/13561820.2010.483366>

15. Thistlethwaite, Jill. "Interprofessional Education: A Review of Context, Learning and the Research Agenda." *Medical Education* 46, no. 1 (January 2012): 58–70.
<http://dx.doi.org/10.1111/j.1365-2923.2011.04143.x>

16. Oandasan, Ivy, and Scott Reeves. "Key Elements for Interprofessional Education. Part 1: The Learner, the Educator and the Learning Context." *Journal of Interprofessional Care* 19 Suppl 1 (May 2005): 21–38.
<http://dx.doi.org/10.1080/13561820500083550>

17. Krathwohl, D. R. A revision of Bloom's taxonomy: An overview Theory into Practice (2002) 41 (4) 212-218. http://dx.doi.org/10.1207/s15430421tip4104_2

18. Fink, L.D. *Creating Significant Learning Experiences: An Integrated Approach to Designing College Courses* Jossey-Bass, John Wiley and Sons, San Francisco, CA (2003).

19. Olupeliyawa, Asela M., Chris Hughes, and Chinthaka D. Balasooriya. "A Review of the Literature on Teamwork Competencies in Healthcare Practice and Training: Implications for Undergraduate Medical Education." *South-East Asian Journal of Medical Education* 3, no. 2 (December 1, 2009): 61–72.

20. D'Amour, Danielle, Lise Goulet, Jean-François Labadie, Leticia S. Martín-Rodríguez, and Raynald Pineault. "A Model and Typology of Collaboration between Professionals in Healthcare Organizations." *BMC Health Services Research* 8, no. 1 (September 21, 2008): 188.
<http://dx.doi.org/10.1186/1472-6963-8-188>

21. Oandasan, Ivy, and Scott Reeves. "Key Elements of Interprofessional Education. Part 2: Factors, Processes and Outcomes." *Journal of Interprofessional Care* 19 Suppl 1 (May 2005): 39–48.
<http://dx.doi.org/10.1080/13561820500081703>

22. Finch, Janet. "Interprofessional Education and Teamworking: A View from the Education Providers." *BMJ : British Medical Journal* 321, no. 7269 (November 4, 2000): 1138–40.
<http://dx.doi.org/10.1136/bmj.321.7269.1138>