Integrating Health Systems Science in early undergraduate medical education: barriers to implementation and lessons learned

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Abstract

Incorporating health systems science (HSS) into medical school curricula is important, but there are numerous barriers to implementation, including lack of prioritization of this content by students. We performed a pilot intervention to integrate HSS content with clinical skills in a Hospital Medicine preceptorship for first-year medical students, with a focus on student and faculty responses to the curriculum. Students responded to surveys about their learning and experience with the curriculum, and faculty members described their experience working with the students. We identified multiple barriers to implementation, the largest being that students were reluctant to spend time on HSS content and preferred to focus on traditional clinical skills. This empiric study of student-perceived barriers to uptake of HSS content confirms prior studies that have anticipated but not tested for the presence of these specific, student-framed barriers in practice.

Keywords: health systems science, professional identity formation, undergraduate medical education, systems-based practice, workplace learning

Introduction

The increasing emphasis on health systems science (HSS) requires that this content be delivered to learners, but implementing HSS may be challenging for institutions. Ideally, learners will utilize learned HSS skills to contribute meaningfully to systems improvement, thereby promoting experiential learning and benefiting the healthcare environment directly; however, best practices for operationalizing this process have not been fully developed, largely...
due to numerous cultural and logistical barriers. These barriers include lack of appropriate faculty, financial, and logistical resources for program development (Gonzalo, Baxley, et al. 2017), as well as institutional culture around HSS (Gonzalo, Dekhtyar, et al. 2017). At the learner level, barriers including students’ perception that they lack the skill necessary to succeed in HSS work, deprioritization of HSS content due to focus on standardized exams, and a sense of a culture that de-emphasizes HSS learning (Gonzalo et al. 2016; Gonzalo, Dekhtyar, et al. 2017; Skochelak et al. 2017) have been anticipated by both faculty experts and students; it has been unclear whether these barriers would be borne out in actual studies of student immersion in HSS work. In this pilot, we developed an integrated HSS and clinical skills curriculum for first-year medical students, with an emphasis on students’ responses to the content; we herein report our findings, which confirm and further the research on barriers to implementation of HSS content. The description of these barriers may help other institutions seeking to incorporate similar curricular content.

**Methods**

First-year students in our School of Medicine were assigned to "preceptorships," consisting of 17 half-day sessions focused on clinical skill acquisition with real patients. For the 12 students assigned to the inpatient Medicine preceptorship for 2015-16, we developed a curriculum with didactic and experiential components, with learner objectives of defining basic quality improvement (QI) terms and applying systems processes to QI projects. Students were introduced to QI terminology and methods, high-value care, health information technology (HIT), and patient experience through interactive workshops led by faculty with expertise in the content area and teaching skills. Students applied these concepts to address targeted quality gaps in our clinical environment: reducing unnecessary phlebotomy, improving inpatients’ sleep, improving the electronic health record (EHR) interface with primary teams, and humanizing patients through a program to display their personal photos in their hospital rooms. Students provided feedback via survey after each HSS session, directly to faculty mentors through informal conversation, and in an anonymous final course survey. They also were observed practicing skills in the classroom and with patients. Their formal assessment was based on participation in all curricular activities, but did not include specific knowledge or skill acquisition. Faculty provided their perceptions through a survey. We report descriptive statistics for the Likert scaled items and conducted thematic analysis of the comments.

**Results**

Response rate was 100% for student surveys. Students felt they could define QI terms [mean 4.2 on 1-5 Likert scale of "strongly disagree" to "strongly agree," standard deviation (SD) 0.72], identify QI gaps/needs (mean 3.9, SD 0.51), develop QI project goals (mean 4.0, SD 0.60), and describe factors driving healthcare costs (mean 3.8, SD 0.58). Students’ scores for questions around clinical skills (i.e., history-taking) were generally higher (means 4.0-4.5). They felt they would utilize the HSS skills in their future careers (mean 4.0, SD 0.60).

Qualitative analysis of student comments indicated that students desired increased focus on clinical skills and decreased attention to HSS, in addition to other concerns (see Table 1). No student described any aspect of the HSS content when asked to indicate the "best part about the curriculum." Furthermore, students’ in-person comments suggested a fear they were "missing out" compared to their peers, whose preceptorship time was devoted exclusively
to clinical content. Students verbally described to their preceptors a tension regarding emphasis on HSS content in our curriculum, given that it was not tested or reinforced elsewhere during their training.

Facilitator feedback described students’ ability to engage in high-level analytic thinking in HSS and accomplish tasks that would not otherwise get done. Review of students’ projects revealed significant contributions to the clinical environment. In HIT, for example, students helped streamline provider communication from the EHR by tracking clinical services with workflows outside standard paging practices. In their survey, faculty also reflected on challenges, including students’ reluctance to dive into specific tasks of systems work, such as talking with patients about non-clinical issues.

Table 1: Themes from student surveys

<table>
<thead>
<tr>
<th>Theme</th>
<th>Representative comment or supporting evidence</th>
</tr>
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<tbody>
<tr>
<td>Can learn, and see benefits of learning,</td>
<td>“…it’s really cool to learn about hospital systems... I really do think that it's enabled me to think about</td>
</tr>
<tr>
<td>systems skills</td>
<td>broader issues and it's given me a foundation to work from when I'm a practicing physician.”</td>
</tr>
<tr>
<td>Clinical skills more valued than systems</td>
<td>&quot;I think all of the sessions need…incorporation of patient care/physical exam skills.”</td>
</tr>
<tr>
<td>skills</td>
<td></td>
</tr>
<tr>
<td>Worry about missing out compared to other</td>
<td>&quot;I…feel that the preceptorship/selective experience has been lacking compared to the traditional model.”</td>
</tr>
<tr>
<td>curricula</td>
<td></td>
</tr>
<tr>
<td>Faculty contact is highlight</td>
<td>&quot;The best aspect was definitely the preceptors.” &quot;…the people and their guidance of us as first year medical</td>
</tr>
<tr>
<td></td>
<td>students was the absolute best part.”</td>
</tr>
<tr>
<td>Disagree on how to structure teaching on</td>
<td>&quot;I really like the format of having dedicated QI project time, followed by focused clinical time - I feel like</td>
</tr>
<tr>
<td>systems-based content</td>
<td>we get a lot out of it and it's a great use of time!”  <em>versus</em>  &quot;How the time is split between projects and the</td>
</tr>
<tr>
<td></td>
<td>wards. I would recommend doing only one during a single session.” <em>(on worst part of curriculum)</em></td>
</tr>
</tbody>
</table>

Discussion

First-year medical students in our pilot were able to develop HSS skills and utilize them in improving the clinical environment in tangible ways, even over a brief period of time and in absence of prior experience.

Students were also able to recognize the impact of HSS learning on their development as physicians. However, the students remained hesitant to engage in HSS content, deprioritizing it compared to more traditional clinical skill-building. This confirms that students engaging in this work encounter similar barriers to those anticipated by the students in Gonzalo et al.’s prior study (2016). In concordance with findings from that research, we suspect this perspective is due to the early medical learner's view of his/her professional identity formation (PIF) as centering on traditional "doctoring," or clinical, skills (Finn et al. 2010). To our knowledge, this is the first empiric study of student-perceived barriers to uptake of HSS content; our work confirms prior studies that have anticipated but not tested for presence of these specific, student-framed barriers in practice. This evidence raises several additional
questions regarding how best to implement HSS curricula, including the optimal time during training to introduce the content for purposes of leveraging knowledge about PIF; how best to assess students' HSS skillset acquisition for purposes of enhancing students’ prioritization of the content; how to create sustainable structures for faculty involvement in facilitating student learning of HSS; and how best to integrate HSS content with "traditional" clinical skills teaching to optimize students’ perception of the value of HSS. Future work may be able to elucidate best practices around HSS curricular implementation in context of these barriers and the questions they raise.

**Take Home Messages**

Early medical learners are able to learn HSS skills and contribute meaningfully to systems work that benefits clinical environments, but they are reluctant to do so and prefer to prioritize "traditional" clinical skills. This may be due to their natural professional identity formation development and its interplay with a culture that de-emphasizes systems skills by failing to reinforce them with formal assessment and other focus on this content elsewhere in the larger medical curriculum. Further research may help reveal best practices for overcoming these student-derived barriers to implementing HSS curricula.

**Notes On Contributors**

All authors are clinician-educators in the Division of Hospital Medicine at the University of California, San Francisco.

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Appendices

Declaration of Interest

The author has declared that there are no conflicts of interest.