Healthcare 7 (2019) 100348

Contents lists available at ScienceDirect

Healthcare

journal homepage: www.elsevier.com/locate/healthcare

Case report

A new model of online health care delivery science education for mid-career health care professionals

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A B S T R A C T

Health care delivery science focuses on ways to improve health and health care services provided to individuals and populations. Health care professionals must be trained in health care delivery science in order to diagnose and treat the sources of health care system dysfunction and achieve better outcomes while controlling costs. The ideal model for health care delivery science training has not been fully defined, but doing so is critical especially for frontline mid-career health care professionals whose original clinical training omitted these concepts. To better prepare leaders to address the complex challenges of health care, we created a novel hybrid residential/online 18-month master's degree in health care delivery science. Key strengths of the program are the curriculum, pedagogy, teaching team and close-knit cohort. Here, we discuss the program design rationale and six years of evaluation data of a novel master of health care delivery science program. Novel online education in health care delivery science can empower inter-professional leaders in multiple leadership positions throughout health care to improve the United States health care system.

1. Background

The United States health care system produces mediocre outcomes at high costs, and there are huge disparities in the quality of care. Such inefficiencies and inequities are driven by multiple factors, including perverse health care incentives, clinical habit, institutional inertia, neglect of underlying health determinants, and a poor alignment of the structure and capabilities of our health care system with capacity to deliver proven public health interventions.[1–4]

To reform this historic waste of the United States health care system's otherwise unmatched resources and technological sophistication, front-line clinicians, delivery system leaders, health plan administrators and policy makers need new knowledge and skills not traditionally taught in health professions schools. Current health care leaders report that the skills required for proper execution of their roles include leadership, change management, and innovation while few institutions emphasize these skills in clinical education.[5,6] Leaders of change in health care need to understand the underlying causes of poor system performance and how to catalyze improvement, including through the development of skills in management and organizational change[7–11].

Academic programs within medical and business schools have begun to address this gap by creating degree and non-degree programs to educate undergraduate and graduate, professional or executive, part-time and full-time students in the growing field of health care delivery science.[12–19] We describe here how our organization developed a full-time degree program in health care delivery science for mid-career professionals.

2. Organizational context

Within our college, we drew on the strengths of two partnering programs, the school of business and, within the medical school, an institute focused on health policy and clinical practice, to develop a degree program in health care delivery science. Health care delivery science (HCDS) is the study of the provision of health care and the development of frameworks and theories to improve health and health care services provided to individuals, communities and populations.[18–24] Health care delivery science focuses on improving health via improved systems for delivering health care. Health care delivery science brings together concepts, methods and tools from medicine, the social sciences, public health, population health, engineering, and business with the goal of improving individual and community health

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https://doi.org/10.1016/j.hjdsi.2018.12.002
Received 24 October 2017; Received in revised form 26 November 2018; Accepted 19 December 2018
Available online 04 January 2019
2213-0764/

while reducing waste and harm.[25] Critical to health care delivery science are the insights needed to understand why health care systems are failing to meet the needs and wants of the populations they serve, and a new set of skills necessary to manage and lead health care organizations such as hospital systems, payer organizations, and government agencies.[6] As its name implies, HCDS focuses on the processes and organizational structures that influence the provision of health care, rather than the biological sciences that have been the traditional emphasis in medicine.

The institute of health policy and clinical practice - an accredited program in public health – emphasizes student learning about health system performance, variations research, systemic overdiagnosis, and new payment models.[26–30] The school of business is home to research and educational programs in management, leadership skills, health care economic analysis, organizational behavior, and operations management. These programs have jointly conducted research in management with health care delivery, including work on hospital finance, social marketing for consumer health, reverse innovation, physician leadership, and improving patient flow.[31–35] Planning for this master's program was supported via the home institution and guided by leadership of both schools while program leaders were given latitude to develop a collaborative program built on institutional strengths. Faculty with backgrounds in medicine, population health, and management science were selected based on their scholarly expertise and willingness to participate in this new form of teaching. Resources were dedicated to faculty development, including cross-disciplinary training, curriculum integration, and preparation for the online learning environment.

3. Problem

To address the need for education in health care delivery science in a fashion that harnessed the strengths of our academic institution, we developed a degree program that could serve the needs of diverse health care leaders from around the country. The program – a Master of Health Care Delivery Science – was created to be distinct from traditional programs in health policy or management, for example Master of Public Health, Master of Business Administration, or Master of Health Care Administration degrees, by creating an integrated curriculum that incorporates concepts as diverse as population health and management principles all oriented toward improving health via improving the performance of complex health care systems.

To achieve this goal, we built a curriculum to address gaps between traditionally-taught material and the needs of health care leaders. We built a supportive learning environment and student sense of community via interactive pedagogies and online technology. The program was designed to serve the needs of busy mid-career health care executives who cannot suspend their careers for one to two years to engage in a traditional on-ground academic program. Delivering coursework to this geographically dispersed student body necessitates an online approach that captures the high-quality standards and relationship-based learning experience characteristic of other residential degree programs at our institution.

4. Solution

We designed and implemented an accredited health care delivery science master's degree program for health care professionals through combining online and residential (on campus) educational experiences. The program spans 18 months and complements online coursework with 4 short periods in residence at the college. Below, we describe the key features of this program including the curriculum, pedagogy, teaching team and close-knit student cohort (Fig. 1).

4.1. Curriculum

The program curriculum was built around an integrated set of program learning objectives. The three overarching program learning goals are:

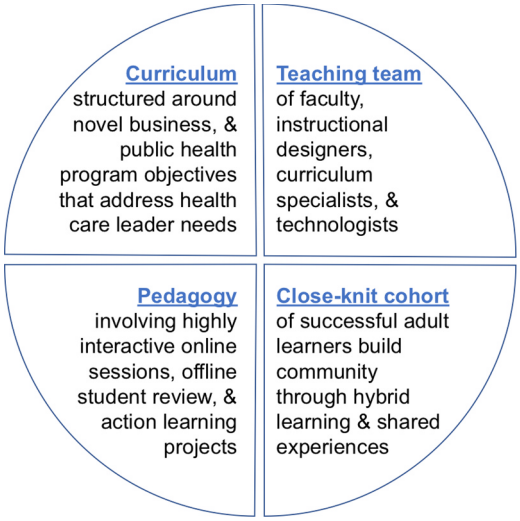

Fig. 1. Key features of the masters program in health care delivery science.

- To enable students to envision the future of their organization in the evolving sectors of health and health care delivery;
- To equip students to lead change in their organizational setting; and
- To help students meet their own personal and professional development objectives.

These overarching learning goals, which were selected without the constraint of pre-existing accreditation requirements, address the career needs of health care leaders and drive course selection and generation of course learning objectives. Envisioning the future requires an understanding of how value in health care is created, meeting the goals of patients, the discipline of strategy, and knowledge of population health, information technology, and health economics and policy. Leading change involves organizational behavior, teamwork, and management as well as mastery of a health care organization's functional areas, such as finance, marketing, technology and service operations. The program enables professional development through the application of these disciplines and by personalized leadership coaching. Fig. 2 shows the curriculum and Appendix B describes the courses.

We gathered evaluation data through traditional course evaluations and through semi-structured interviews after program completion with recent graduates. In traditional survey evaluations, students rated courses highly every year (Fig. 3). In our semi-structured interviews, we interviewed 215 of 276 graduates (79%) approximately 3 months after graduation (See Appendix A for methodology and analysis). In these interviews, program graduates told us that the curriculum is very applicable to their day-to-day work, and that they often discuss what they are learning with their colleagues at their jobs. One program graduate described the program as having a “unique curriculum, this is the ideal education to deal with change from both a clinical and business perspective.” Another said it served in “stimulating our way to think about how we can bring innovation to our respective institutions,” while a third said that “almost everything was immediately applicable.”

We also use the feedback from semi-structured interviews to identify new topics to add to our curriculum. When we ask what material we should add in the curriculum, students report a desire to learn about new developments in health policy and international health systems, but generally believe that the curriculum meets their needs in developing leadership and management skills. We also ask what material we should omit from the curriculum, and the students report that we should be keeping the core of the curriculum with some modifications

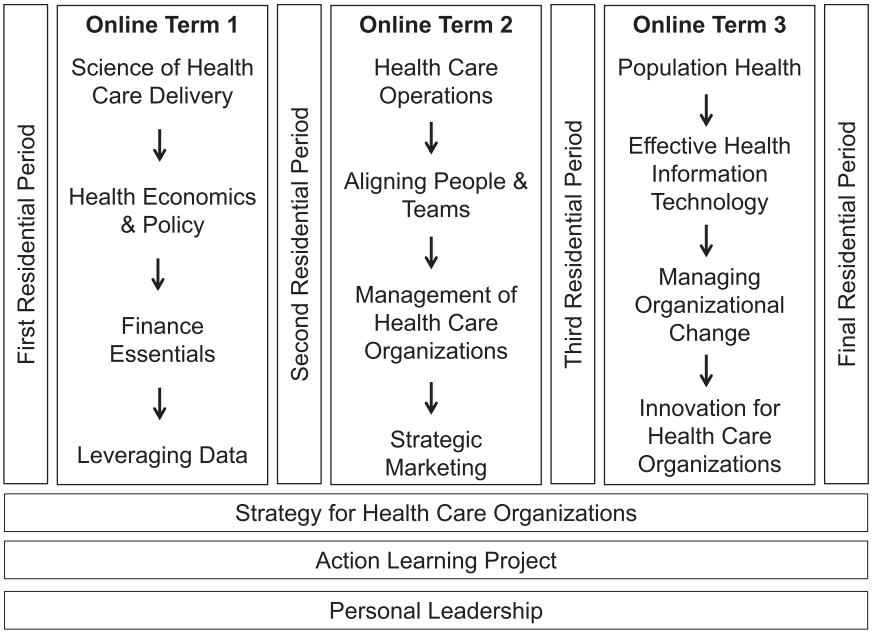

Fig. 2. The 18-month curriculum. Four residential periods lasting 6–14 days bracket 6-month-long online periods comprised of courses taken sequentially, one course at a time. Three courses, Strategy for Health Care Organizations, Action Learning Project and Personal Leadership, span the entire residential and online curriculum. All courses are required for graduation.

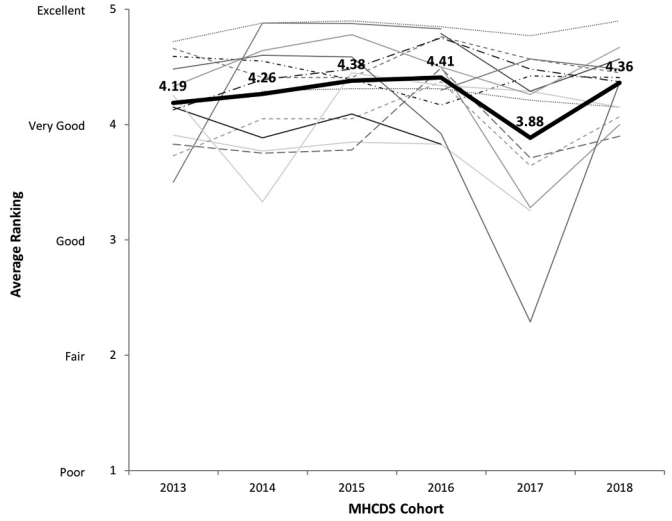

Fig. 3. Six years of student evaluations of courses. The thick black line and accompanying numbers are the average course evaluation scores for each graduating cohort. The thin lines are evaluation scores for individual courses.

based on the rapidly changing health care environment.

4.2. Pedagogy

The structure of the 18-month 15-h-*per*-week hybrid online/residential program is depicted in Fig. 2. During residential sessions, faculty and students interact face-to-face, build community, and develop teams. Students also are introduced to upcoming courses, wrap up concluding courses, and continue on-going coursework in leadership, strategy and an applied project in a real-world health care setting. During the online terms, students take one course at a time, following a predictable weekly rhythm of assignments and synchronous online video conferences called "live meetings."

The program maximizes predictability and flexibility as part of its student-focused design. Students take one course at a time so they can focus on the work of that specific course. The structure of each week of each course is similar: students read, watch recorded lectures, and prepare for the week starting on Monday, the live meeting occurs Tuesday, an individual assignment is due Thursday night, and a group assignment is due Sunday night. To accommodate crises and unexpected changes in their work or home life, the program is flexible with assignment deadlines and permissive with deadline extensions. Live meetings are recorded so students can watch them after the fact. Individuals who miss class or assignments without prior notice are contacted to assure a plan for completion.

The problem-based, applied nature of the program embodies key principles of adult learning.[36–38] Many courses use the case-based teaching method, in which students apply frameworks to make decisions about real-world scenarios. Many courses use original cases, written by program faculty, that address current issues in health care delivery. In addition, course assignments are designed so that students transfer classroom learning directly to their current work in health care.

Students are often asked to connect their work experiences with theories, models and frameworks.[39] For example, in the Organizational Change course, students share stories of successful and unsuccessful change initiatives in their organizations, then identify key themes that led to their success or failure and how those themes relate to established models of institutional change management. In the Personal Leadership course, students evaluate their own leadership style, receive feedback from work colleagues and mentors about these capabilities, and develop a plan to achieve their personal leadership goals. As the course continues, students learn peer coaching skills and engage in peer-to-peer mentoring on the leadership challenges they have each identified. See Appendix B for descriptions of other courses.

Students must apply their coursework to a new change initiative through an experiential learning project called the "Action Learning Project" (ALP).[40] In the ALP, groups of four to six students solve real-world problems using concepts presented in the curriculum, while actively developing leadership and change management skills. Student teams undertake a project of strategic significance at one of the students' home organizations. Typical projects include improving clinical quality to enhance safety or efficiency, reducing fragmentation by integrating health system services for a specific patient group, and forging alliances across multiple health systems to achieve common health outcomes. The ALP concludes with student reports on the business and health outcomes of their work. See Appendix C for additional examples of action learning projects.

Cycles of direct feedback and improvement occur at multiple levels of the program. At the individual level, students set initial personal and

professional goals and revisit those goals periodically. Students reflect on these goals in written journal entries that program staff review. At the course level, students complete traditional anonymous course evaluations that are used in teaching team debriefs to improve the next course cycle. This feedback loop allows the program to respond quickly to student concerns. At the program level, staff conduct semi-structured telephone exit interviews with graduating students to gather input on opportunities for program-wide improvement. Exit interview data, as well as comparative course evaluation data, are reviewed by the program's Curriculum Committee during an annual retreat in which program-wide curriculum decisions are considered. Fig. 3 summarizes the results of the program evaluation since the program start in 2013, showing that mid-career professionals consistently rate the program as very good to excellent. Given that this program is novel, we do not have institution-wide benchmark data to compare these ratings versus other hybrid program evaluations at our institution. For one possible point of comparison, the comparable average course evaluation score for required courses in the school of business is 3.9 out of 5.0.

Our curriculum is delivered through three primary technologies: a learning-management system (Canvas) that serves as a central repository for all readings, recorded videos, and assignments; a video conferencing platform (Zoom) that allows socially-engaging, synchronous live meetings among groups of up to 30 students, faculty and staff; and an online cloud service (Google Drive) to facilitate collaboration on assignments. These technologies were chosen with the goal of making this type of distance education at least as interactive online as education in a face-to-face setting. Given the importance of community and peer-to-peer learning, students communicate frequently with each other via email, text, phone, and videoconference.

Rather than trying to replicate the classroom experience, the aim of the technology used in the program is to create a richer and more interactive experience for student learning. Weekly live meetings via videoconference allow face-to-face discussion, which resemble interactions of a physical classroom but with a parallel written chat running concurrently to supplement concepts and allow social connections in class. Course assignments include asynchronous discussion boards where students present ideas and build on each other's knowledge. Research indicates that such asynchronous discussions are perceived as more open and democratic, since no single individual can dominate the conversation (36), and may encourage students to disclose more personal information[41,42].

4.3. Teaching team

The program has assembled an interdisciplinary faculty to deliver courses. Because the program is aimed at transforming health care delivery at the organizational level, the curriculum requires integrated faculty partnerships between those trained in population health and management. This integration initially was facilitated through twice-monthly, 90-min integration seminars where faculty members shared teaching materials and discussed how a specific topic would be taught in each of their fields. These seminars allowed for greater integration and reinforcement of learning across the curriculum. These seminars are still conducted semi-annually, often with guests who share novel ideas or health care trends that are then discussed by the interdisciplinary faculty.

Dedicated inter-professional instructional teams are critical to the successful delivery of the program. Each course is developed and taught by a team consisting of a faculty subject-matter expert; a curriculum specialist experienced in online learning, students and the overall curriculum; an instructional designer skilled in online pedagogy and learning management systems; and an educational technologist proficient in online technologies used in the course. Recruitment and training of MHCDS staff emphasizes top performance and innovation. The team-based teaching model requires a strong service culture, as both faculty and students are considered customers. This team support results in an enhanced student experience and enables more efficient and effective use of the faculty member's time. A culture of innovation allows the unique contributions of each teaching team member to be valued and creates fertile ground for the continual improvement of courses, curriculum, and the learning experience.

Students report they value the supportive teaching team and consistently rate faculty as high quality. One program graduate said in an interview, “[The faculty] are the people shaping opinion in the world and we get access to them in real time.” Another program graduate said, “several faculty, in particular, were both exceptional talents and completely accessible. It was a great experience to be treated collegially by such great faculty.” The curriculum specialists, instructional designers and educational technologists are also listed by the students as valuable contributors to their online learning experience by being responsive, resourceful and supportive.

Table 1
Demographic Characteristics of Students.

Description	Statistic
Cohort size	
Class of 2013	45
Class of 2014	45
Class of 2015	41
Class of 2016	53
Class of 2017	44
Class of 2018	49
Class of 2019	41
Class of 2020	40
Gender (% Female)	39%
Health Care Delivery Segments	
Physicians	56%
Hospital/Health System Executives/Nurse	25%
Policymakers/Regulators	9%
Payers (Health Plans/Insurance)	10%
Other (Medical Device/HIT/Consulting/Home Care)	10%
Years of Work Experience (Mean)	23

4.4. Close-knit cohort

The program started in July 2011 and has just admitted the eighth cohort of 40–50 students (Table 1). As of 2018, there are 276 graduates, and students are mid-career health professionals with 10 or more years of work experience in the health care field. Within the class are CEOs, presidents, executive directors, chief medical officers, and other senior leaders from diverse health care organizations like hospitals, clinics, insurance companies, and government agencies. Most already have advanced degrees: roughly two-thirds have terminal degrees in medicine, nursing or pharmacy; others have business or law degrees. Classes are demographically diverse (see Table 1), and include students from North America, Europe, Asia, South America, and Africa.

Although online education is now common and generally recognized as effective,[39,43] the online environment does not typically foster a sense of community. However, health care transformation requires bringing together a diverse set of experiences and perspectives through multidisciplinary collaboration. To nurture this community, the program deliberately structures student interaction. Coursework in leadership and teamwork give students skills and frameworks for building effective teams. During residential sessions, shared knowledge and shared experiences lead to friendship and trust. During online courses, the mutual responsibility of weekly group assignments further strengthens relationships. Students complete half of their assignments in study groups consisting of 4–5 individuals. We also encourage peer learning, where students with real-world expertise in a subject area are able to share their perspectives and experiences. Students report that one of the greatest strengths of the program experience is learning from their diverse colleagues. One program graduate told us, “… the value

we derive from the program is from interactions with our classmates [and] from interaction with the content." Program graduates also report frequent contacts and collaborations with their program colleagues and graduate engagement has been strong.

5. Lessons for the field and unresolved questions

We have learned two key lessons to share with other groups interested in launching innovative educational programs for mid-career health care professionals. First, we tailored the program to the needs of this specific target group of potential students. This process required innovative teaching models and adaptation for the online environment. We applied and adapted new pedagogies tailored for adult professionals to ensure student success, making the program predictable and flexible, and we expanded the teaching team to include more online learning and technology expertise. Second, the hybrid program was designed to help students learn from each other as well as from the faculty and course material. The close-knit student community and peer network resulting from these efforts will help health care professionals lead their organizations well after their graduation.

We continue to improve and evaluate the success of this program. One unknown question is the degree to which we have been effective in providing mid-career health care professionals with the skills and knowledge to become effective leaders in health care organizations. Measuring this is a key challenge, as we lack a control group to benchmark student success. As the program evolves, we intend to survey career progress in our program graduates five years after graduating from the program.

One ongoing challenge of the program is to keep up with the rapid changes in the health care environment, and to continue to develop a vision for the future of health care. In Fig. 3, we can see a "dip" in course satisfaction scores that was caused, in part, by our failure to meet this challenge. In particular, a course in 2017 was poorly rated because it was perceived by students to focus on current problems in the field, and was not sufficiently forward-looking. A dramatically redesigned course was well-received in the next year.

With numerous successful programs in health care delivery science emerging at educational institutions across the country, we may be defining the field of health care delivery science through the curriculum of these programs. In the absence of accreditation bodies, emerging master's degree programs are being created in response to the needs of potential students, creating challenges in comparing the educational achievements for diverse academic programs.[44] As academic efforts to define the field of health care delivery science are emerging, the role of educational programs in contributing to these efforts should be strengthened, including via the incremental standardization of program curricula.

To prepare leaders to address the complex leadership challenges of health care, we created an 18-month master's degree in health care delivery science. Key strengths of the program are the curriculum, pedagogy, teaching team and close-knit cohort. Novel programs in medical education can address the current gap in education for leaders in health care who will lead their organizations toward high-value health care.

Appendix A. Interview analysis methodology and key themes

We conducted semi-structured telephone interviews with 215 of 276 (78%) students in the cohorts. At the time of the interviews, students had completed from the program from 3 to 6 weeks earlier. Interviewers had a shared interview guide describing how to conduct the interviews and how to record notes from the interviews. Interviewers asked four questions:

1. If you were describing [the program] to a friend or colleague, what would you say were the best things about the program? What would you tell them needs most improvement in the program?
2. What topics in the curriculum should be given more time? Are there any topics that we didn't cover that you think we should add? What topics in the curriculum should be given less time, and are there any topics you would cut out?
3. What would you change about the [the program] teaching model (for example, feedback/grading, weekly rhythm, type of technology used, types of assignments, live meetings)? (*Question omitted with 2018s)*
4. Several of your colleagues have changed jobs or job titles since starting [the program]. Our records show that you are XXX at XXXX. Has this changed?
5. Is there anything we haven't asked that you want to tell us (about anything)?

Students were invited to participate in interviews through email invitations to the entire cohort from the program director. Interviews were scheduled for 15 min at a convenient time for the student. Program staff conducted the interviews over the telephone. Interviewers were provided with a form for entering in answers to questions and tips for conducting the interviews. Interviewers took notes during the interview and these notes were used to analyze the results of the conversation. Interviews were not recorded nor transcribed. These notes were imported into the NVIVO (2013–2015s) or DeDoose (2016–2018s) qualitative analysis software for thematic analysis. Coding was conducted by AEF, supported each year by other program staff or student research coders. Each cohort was interviewed, analyzed and reported separately. The results here are an aggregate of these separate analyses.

Completion Rates by Cohort

Cohort (Graduation Year)	Response rate (n of N, %)
2013s	33 of 45 (73%)
2014s	43 of 45 (96%)
2015s	36 of 41 (88%)
2016s	40 of 53 (75%)
2017s	36 of 44 (82%)
2018s	27 of 48 (57%)

Key themes

The focus here is on the themes related to the strengths and areas for improvement in the program. Information on specific courses, faculty, or students has been omitted. Additionally, we focus on themes that reoccurred across multiple cohorts.

1. The most frequently mentioned best thing about the program is the other students. Their colleagues are dedicated, like-minded, and the "right type" of classmates. Students value the diversity of their peers' background and perspective and appreciate the design in the program to facilitate student connections like study groups and dorm rooms. The network they form is a valuable resource, and they learn from their peers.
2. The program is tailored to the needs of our students. They believe the program is unique, applicable to their work, doable with their workload, and flexible to accommodate their work.
3. Our curriculum is a key strength of the program. We teach important and relevant things. Students believe that they learn a way to fix health care, to know where things are going, and have the tools to participate in the conversation. The coursework is an especially valuable piece of the program, especially because it builds and is integrated throughout the program. The students appreciate the balance of coursework from the business school and the institute of health policy and clinical practice, and mention this as an advantage of our program over traditional MBAs and MHAs.
4. Separate from the curriculum (what is taught) the students value our learning model (how it is taught). Students see the strong teaching skills of the faculty and support from the staff as key to our learning model. They like the business case method for teaching.
5. The area where students report the greatest need for improvement is in keeping the curriculum up-to-date with changes in the health care delivery environment, especially United States health policy and international health systems. Students often ask for more examples of innovative health care systems that are successful in enacting major changes.

Appendix B. Course descriptions

Science of Health Care Delivery: To lay the groundwork for making students capable of undertaking systemic redesign of health care delivery.

Health Economics & Policy: To develop knowledge of health economics that enables students to understand the current state of affairs and to incorporate sound economic analysis in their role as managers.

Finance Essentials: To develop a framework with tools and models to enable students to make value-enhancing financial decisions in health care delivery.

Leveraging Data: To attain skills in developing and analyzing the findings from structured clinical studies and learn to use those findings to aid in decision-making.

Health Care Operations Management: To provide students with the language, concepts, insights, and tools to evaluate, design, and operate health care processes in order to increase value for patients and reduce costs.

Aligning People and Teams: To examine alignment through the lens of applied psychology, particularly theories of motivation, and explore how motivation theory and research inform important tools of alignment.

Management of Health Care Organizations: To explore management of all aspects of a health care organization that are necessary for success, from human resources to credentialing, from finance to supply management, and from union management to physician management in a voluntary staff model.

Strategic Marketing: To apply the marketing philosophy (creating, communicating and delivering value) and tools (segmentation, targeting and positioning) to develop in-depth knowledge of marketing research and health decision-making.

Population Health: To understand the multiple determinants of health, how to measure health outcomes, how health behaviors can be modified, and how health disparities and socioeconomic status influence population health status.

Effective Information Technology: To review critical topic areas in applications of technology to improve delivery of health care.

Managing Organizational Change: To prepare the student for the challenges in accomplishing significant change in health care organizations.

Innovation for Health Care Organizations: To prepare students to lead an innovation initiative in health care delivery or to support, enable, or catalyze the efforts of those who do.

Strategy for Health Care Organizations: To develop a framework for formulating and evaluating strategic decisions, tools for identifying opportunities and evaluating alternative paths, and methods for encouraging innovation.

Action Learning Project: To apply classroom concepts to real organizational challenges that reinforce the learning experience and to improve business and clinical performance for the client organization.

Personal Leadership: To provide students with the knowledge to increase their personal leadership capability.

Appendix C. Descriptions of a selection of action learning projects

Improved access to lifesaving medications for mothers and babies in rural Nepal by modernizing the medication ordering process using mobile phones. Their pilot program used real-time data collected from mobile phones to improve supply-chain management and distribution. Following the pilot, 99% of rural health centers maintained adequate stocks of medications for normal labor and delivery. The project continues to evaluate the effects on the health of mothers and babies.

Improved diabetes self-management at one academic medical center through ambulatory intensive management, continuous care, and use of innovative glucose monitors. During the pilot, the cost per glucose measurement was reduced to less than $9 from approximately $31, while improving patient activation, lowering HbA1C measures for the pilot population, and potentially avoiding tens of thousands of dollars in inpatient costs. The underlying monitoring technology continues to be developed in a joint venture between Verily and Sanofi.

Improved the delivery of imaging services across a multi-state region through professional coordination, provider engagement, and improved information technology, resulting in decreased healthcare expenditures while achieving similar or improved quality of care and outcomes for all patients in the region.

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