Abstract
We introduce the Applied Health Informatics Bootcamp. This is an intense, interactive on-site program, augmented by approximately 80 hours of online material. The Bootcamp is intended to introduce those with little or no knowledge of Health Informatics (HI) to the nature, key concepts, and applications of this discipline to addressing challenges in the health field. The focus of the program is on Applied Health Informatics (AHI), the discipline addressing the preparation for, and the procurement, deployment, implementation, resourcing, effective usage, and evaluation of informatics solutions in the health system. Although no program of this duration can cover all topics, we target the high profile areas of Health Informatics and point the participants in the direction of broader and deeper explorations.

Introduction
Canada has found itself in the position of seeing the creation of an Electronic Health Record (EHR) on every Canadian as a key strategic resource for maintaining and caring for the health of its citizens. By EHR we mean a “womb to tomb” record of all aspects of health and healthcare in electronic form that is highly secure but accessible by authorized individuals. Over the last several years Canada has begun investing billions of dollars through agencies at the federal and provincial levels of government towards realizing the EHR. As this work has proceeded, it has become clear that Canada has a major human resources (HR) gap that is seriously impairing the ability to deliver, implement, promote and evaluate the needed informatics solutions. This is especially true related to areas such as information management and the complementary factors of technology, including process re-engineering, management of change, adoption management, role and organizational restructuring, and so forth. Estimates of the number of needed applied health informatics professionals in Canada have ranged from 2,000 to 15,000.

There are many education and training programs that have emerged in Canada, ranging from community college diploma and bachelors programs (e.g., Conestoga College, Kitchener, Ontario), to university-based undergraduate (University of Victoria, Victoria BC) and graduate programs (e.g., Dalhousie University, Halifax, Nova Scotia, and University of Sherbrooke, in Sherbrooke, Quebec). However, in total, these programs produce fewer than 100 graduates per year, and, despite the growth of the number of programs, this will not change substantially for years. In addition, some of the newer programs are facing serious challenges in recruiting students.

We realized several years ago, in discussions that led to the AMIA 10 X 10 program in the United States, that an innovative approach was needed to address the HR gap at least related to applied health informatics. As there already existed excellent programs and many more were in the process of emerging, we came to the conclusion that our efforts should focus on raising awareness of potential careers in this discipline, on stimulating interest in part-time or full-time studies under one of the existing programs and in encouraging a self-directed life-long learning process that might periodically use the resources of these formal programs.

In response to our perceptions of the need and the reality of existing programs, we undertook to develop, under the auspices of the Waterloo Institute for Health Informatics Research (WIHIR), and deploy the Applied Health Informatics (AHI) Bootcamp. We have constructed the Bootcamp as a means of raising awareness of AHI, providing a basic level of knowledge for those in information services roles, and introducing individuals to the possibility of a career in AHI in the health system. The Bootcamp is a broad but shallow program that not only does not compete with existing educational offerings at colleges and universities, but, in fact, aims to promote attendance at these programs.

Development Methodology
The Bootcamp was designed to introduce the competencies we defined in our earlier work.

Our team identified competencies that could be introduced in a relatively short program, focusing on key knowledge needed by individuals to function in AHI positions. These competencies were mapped to a set of approximately 60 sessions of duration between one-half and one hour, which was seen to be a duration suitable for adult attention spans. The number of
sessions has been expanded since we did our initial work based on feedback from participants. The program design was under the oversight of an organizing committee and is subject to review after each occurrence of the Bootcamp.

To ensure the quality of content, all teachers have been provided with content and presentation guidelines and presentations must be available for review prior to the sessions.

Program Learning Objectives

We have designed the Bootcamp so that, after participating in it, participants will be able: (1) To understand the current landscape of the practice of Applied Health Informatics; (2) To better determine and define their own areas of interest; (3) To undertake advanced explorations into their areas of interest; (4) To launch a systematic process of broadening and deepening their knowledge and skills; and (5) To access Health Informatics information resources and training opportunities.

Teachers

Approximately 40 teachers have contributed to the program, bringing expertise in various aspects of Health Informatics from academia, the health system and industry. They include academics and senior professional experts. Bootcamp teachers are selected based on their expertise, experience, and ability to present.

Program Audience

This program is intended for the following types of participants: (1) Healthcare providers (e.g., physicians and other clinicians interested in becoming involved in AHI); (2) IT Professionals in health organizations; (3) Community College and Secondary School teachers; (4) Professionals within health sector agencies and services organizations (e.g., government, NGOs, community access centers); (5) Management and staff from private industry; and (6) Individuals interested in obtaining employment in Health Informatics.

No background is assumed, but knowledge of healthcare and of the health system is an asset.

Bootcamp Content

The Bootcamp is intended to introduce all key AHI knowledge areas. The majority of this content is available in the online archive. The currently available topics are listed in Appendix 1. At each Bootcamp occurrence, we have added new topics and, if necessary, redone others where the presentations needed improvement. However, more and more of the onsite component of the Bootcamp is being dedicated to issues of local importance and/or to interactive sessions.

The structure of presentations has been standardized with all sessions adhering to the following session structure: (1) Motivation for addressing this topic and its importance; (2) Outline of the contents of this session; (3) Brief overview of each selected sub-topic, including the definition of key concepts and the identification of experts; (4) Reflections and insights; and (5) A list of resources for further learning including key experts, websites and literature.

Bootcamp Format

The program has 2 components, the onsite sessions and the online sessions. The program has been developed in a way that has permitted the gradual reduction in content delivered onsite, while expanding the amount of material that is available online.

Each presentation has a didactic component, an interactive component, such as a case presentation and analysis, or an exercise, and a question and answer period of 10 – 15 minutes.

The first occurrence of the program was a 5-day onsite program, while the second and third occurrences were of 4 and 3-day durations, respectively. Future instances of the program will have a two-day onsite duration with about 80 hours of online material derived from previous sessions. In a recent program, we added a third day that allowed teams of students to participate in one of 6 projects, which used tightly-defined templates and were completed and presented by team leaders on site near the end of the program.

Online materials are served from a website to which each student is given an identifier and password. The materials are available at several levels of video resolution to allow access by both high and low-speed connections. These archived materials can be reviewed by students at any time. Periodic question and answer sessions are provided by webcast and videoconference to allow students the opportunity to clarify their understanding of the materials.

Through the use of the online component, we have been able to reduce the fee per hour of content from approximately $25 to $15 Cdn. (just in excess of $12 US) per student, and this is being further reduced as we progress.

Program Attendance

Approximately 240 individuals have participated in the 3 occurrences (Waterloo and Toronto, Ontario, Edmonton, Alberta) of the program up to March 2007, with another 150 expected in 2007. An evaluation has
been performed of each offering of the program, revealing a high-degree of satisfaction with it. Evaluation results will be presented. Our experience with the Bootcamp indicates that it was much-needed and that it has initiated individuals into a life-long learning process and a given them the desire to interact with the community of people involved in this area.

Evaluation:

Student Evaluation: We have used Pre and post-tests to assess learning in two of the sessions. This is currently in the process of being revised with the assistance of an e-learning expert.

Program and Teacher Evaluation: A detailed evaluation form is completed by each participant for each teacher and module of the program, and an overall evaluation form is completed by participants at the end of each component of the program. These forms also elicit specific suggestions regarding improving the program. Each faculty member receives a detailed report on his/her performance and how he/she compared to other teachers.

Accreditation

Continuing Medical Education accreditation was received for the 2 Ontario programs. Accreditation by nurse and technologists’ associations is currently being pursued. In addition this program is being prepared for submission to AMIA for accreditation as a 10 x 10 program.

Acknowledgements

The Bootcamp program would not be possible without the assistance of co-hosts, partners and other supporters. Thus far these have included: members of the Waterloo Institute for Health Informatics Research, the University of Toronto Department of Medical Imaging (D. Koff), Sunnybrook and Women’s College Health Sciences Centre (S. Marafioti), the University of Alberta (N. Shaw), Northern Alberta Institute of Technology (R. Stumbar), the Ontario Telehealth Network (E. Brown), the Smart Systems for Health Agency (M. Connolly and B. Seaton), Healthcare Information Management and Communications Canada (S. Huesing), Agfa Healthcare (E. Akyuz), McKesson (R. Dunn), Borden Ladner Gervais (M. Fecenko), Cisco (S. Lawrence), Capital Health Edmonton, VON Canada (J. Shamian), Accenture (M. Katz), COACH, ITAC (C. Adno), CHITTA, (S. Huesing), Grand River Hospital (G. Kears), Bell Canada (A. Ryan), IBM (S. Causi), Canada Health Infoway, 3M Canada, Ormed (C. Sherback), XJ Partners (W. Tatham), 3M Healthcare, Ontario Ministry of Health and Long Term Care and many others.

References

2. Personal communication, Y. Kagolovsky, Conestoga College, Kitchener, Ontario.

APPENDIX 1: Bootcamp Topics

Bootcamp 1

7. Applying Health Informatics 1.
10. Applying Health Informatics 2.
13. The Health User Interface and Interactive Systems
15. The Critical Nature of Health Informatics Relative to the Quality of Care.
19. Health Informatics Education.
20. Major Healthcare Applications 2: Digital Imaging and PACS.
23. The Future and Persistent Issues in Health Informatics.

Bootcamp 2

25. Procurement.
27. Mental Health Informatics.
29. Nursing and Information Systems.
30. Introduction to Bioinformatics.
31. Translational Bioinformatics.
32. Information Systems and IS HR.
34. Industry-Institutional Partnerships
35. Project Management
36. Informatics-Enabled Community and Home Care.
37. The Health Informatics Professional.
38. A Perspective of eHealth in Britain.
41. Completing the Bootcamp: Accessing Online Resources and Discussions.
42. Continuing Education and Maintenance of Competency.
43. Critical View of E-Health.

Bootcamp 3

44. Nature and Components of the Bootcamp Program.
45. Health Informatics: A Bootcamp Perspective.
46. A Critical Perspective on eHealth Strategies.
47. eHealth Infrastructure.
49. Sharing Patient Information within Primary Care Network Teams.
50. Standards and Best Practices.
51. Privacy, Ethics & The Law.
52. Evaluation in Health Informatics.
53. Telehealth Strategy and Progress.
54. E-Laboratory/Pathology & E-Drug/Pharmacy.
55. Translational Bioinformatics.
56. Participant Vendor-Based Case Studies: Overview.