

**Development and Delivery of a Medical Informatics  
Educational Workshop For Family Medicine Faculty**

By  
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**CERTIFICATE OF APPROVAL**

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This is to certify that the Master's Capstone Project of

**Thomas Agresta M.D.**

**“Development and Delivery of a Medical Informatics Educational Workshop  
For Family Medicine Faculty”**

Has been approved

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**Abstract:**

A four hour faculty development workshop on Medical Informatics curriculum design, development and delivery was given to twenty-five Family Medicine Faculty members as a pre-conference offering for the 2008 Society of Teachers of Family Medicine Annual Predoctoral Education Conference by a group of Family Medicine and Informatics faculty experts. Attendees of this workshop were expected to leave having: 1) an improved overall understanding of the field of Medical Informatics, 2) why it might be appropriate to include in the education of future clinicians and scientists, 3) applicability to the curricula that they deliver in their own institutions, 4) examples of how it can successfully be incorporated in medical education and 5) knowledge of how to develop a specific curricular plan for inclusions in their own institutional programs of study.

The workshop included instructional lectures, specific curricular examples from other institutions, a hands-on guided practice session with Medical Informatics focused websites and tools, an interactive faculty facilitated curricular design exercise and a feedback and sharing session. All workshop materials remained available for download to participants afterwards on the Family Medicine Digital Resource Library (FMDRL) a Wiki style repository for educational and conference materials. The session was evaluated positively in formal and informal feedback by attendees for both content and process. In addition each component set of the materials have been downloaded from the FMDRL a total of between 145 and 243 times since posting and a second successful but shorter workshop modeled after this experience has been delivered for the 2010 Northeast Regional Association of American Medical Colleges (NE AAMC) meeting. Continued

efforts at engaging medical school faculty of all backgrounds in understanding and incorporating Medical Informatics principles within their own curriculum is necessary to meet the needs of our 21<sup>st</sup> Century healthcare system and should include multi-dimensional workshops like the one described here as well as other appropriate methods to meet demand. Lessons learned from this experience can be used to develop future faculty development training experiences directed at early and mid-career faculty who already have teaching roles within their respective institutions.

**Introduction:**

**Overview:**

This paper describes the planning, delivery and evaluation of a four hour pre-conference educational workshop focused on a basic overview of Medical Informatics on January 24, 2008 at the Society of Teachers of Family Medicine (STFM) Predoctoral Education Conference in Portland Oregon. (1) The audience of twenty five was comprised primarily of Family Physician educators responsible for the development of curriculum for medical students and residents in Family Medicine. The goals of this workshop were as follows: 1) To introduce attendees to the growing field of Medical Informatics and Primary Care Informatics and 2) To familiarize attendees with some of the resources they can use in designing their own educational programs 3) To stimulate further learning of faculty attendees 4) To facilitate curriculum development of Informatics within a variety of settings as part of medical education. The objectives are outlined in Table 1.

**Table 1- Workshop Objectives for Attendees**

Define Medical Informatics and Primary Care Informatics and their place in current medical practice.
Define the current AAMC Medical School Objectives Project (MSOP) and Family Medicine Curriculum Resource Project objectives related to informatics and their limitations.
Describe some educational resources available for faculty to obtain additional training.
Describe some of the current trends in Healthcare Informatics that could be taught in Medical School and residency. (Electronic Health Records, Clinical Decision Support, Personal Health Records, Public Health Informatics, Telemedicine, Home health monitoring and Health Information Exchange)
Describe current facilitators and barriers to HIT adoption and use by clinicians and patients.
List potential teaching methods and opportunities within curriculum for Medical Informatics topics.
Describe how one might use HIT in quality measurement and improvement curriculum.
Describe some steps that can be taken to optimize outcomes when using HIT during learning.
List some ethical issues raised by the use of informatics that could be incorporated into curriculum.

This workshop utilized a series of mixed educational methods based on adult learning principles that included: 1) active hands-on use of informatics tools 2) didactic lectures 3) small group mentored discussions 4) use of curriculum worksheets aimed at self reflection 5) use of a collaborative wiki portal for information sharing and 6) group

discussion and sharing. These methods were designed to stimulate individual faculty to contemplate pursuing additional education in Medical Informatics and to develop curriculum within their institutions on Medical Informatics topics and skills.

**Background and Rationale (Relevance):**

The Institute of Medicine in several of its reports, *Crossing the Quality Chasm* and *To Err Is Human*, (2, 3) calls for the informed use of information technology to improve both the quality and access to healthcare data for all parties involved inclusive of clinicians and patients. There is a recognized gap however in the information systems envisioned in those reports and even the current “best of breed” systems in use in our clinical environments. An additional gap exists between how it is theoretically possible to use these tools and how they are actually implemented. These gaps exist for many obvious reasons, ranging from the rapidly changing nature of clinical information tools and health informatics standards, to the very imperfect knowledge and skill-set of those in charge of implementing these tools and finally to the inadequacy of the end user training and support. Nonetheless they are being implemented at an ever increasing speed throughout our healthcare environment.

Education of the future physician workforce in the science and tools of Medical Informatics is an important task that is often quoted as one of the major challenges required in this decade if we are to improve the quality of medical care while simultaneously improving its cost effectiveness. There is a dramatic and growing push to have all physicians use an Electronic Health Record (EHR) and for patients to have access to their own Personal Health Record (PHR) within the next few years, as many



believe that this is a critical first step to achieve these goals. As academic health centers, private clinical practices and hospitals adopt these technologies at an increasing pace our students, residents and faculty are by default learning to use these tools to care for individual patients as well as for population management. Yet there is little formal literature on how to best educate our future clinicians regarding these topics in an effective and in learner-centered manner. Technology such as learning management systems, handheld and laptop computers and medical software are being more frequently used as a delivery method for medical education but use of these tools alone is not sufficient. There need to be clearly defined curricular goals, objectives and methods with a specific focus on how the technology will be woven into this process in order to achieve the best educational outcomes for our learners. (4)

At each of our medical schools there is a small cadre of clinical faculty educators, the vast majority of whom have never had any formal training in Medical Informatics, that have the responsibility for development of the majority of the clinical curriculum for students and residents. The curricular content is fluid and ever expanding by nature as new medical discoveries are rapidly made and reported, treatments are developed and the evidence for and against certain interventions are elucidated. Simultaneously as the methods used to deliver this curriculum have been shifting to ones facilitated by the use of technology, the very technology itself is rapidly changing. These faculty members face the daunting task of trying to keep abreast of all of these issues. It is no surprise then that most of these curricula currently have a limited formal focus on Health Information Technology (HIT) despite its rapid expansion within the healthcare delivery environment.

It is clear that all health professionals will require increased skills and knowledge in the effective use of HIT as well as the basic underlying principles of Medical Informatics, even if not couched in those terms.

There is also a well documented need to dramatically increase the both the clinical and IT workforce with specialized skills in Health and Biomedical Informatics in order to meet the current needs of the healthcare environment. Estimates for the number of trained individuals required just to deal with implementation of the stimulus reforms enacted as part of the American Recovery and Reinvestment Act (ARRA), especially the component titled *Health Information Technology for Economic and Clinical Health* (HITECH) Act, of congress - range upwards of an additional 40,000 HIT workers. Many of these individuals will be already within the workforce and will require additional training. These are the estimates for just implementing and supporting HIT systems that already exist, and focusing mostly on hospital systems and their implementations. More individuals are probably needed to develop new more effective systems as well as to train end users for optimal use within the numerous and varied settings that healthcare is actually delivered (5) with some estimates ranging as high as 100,000 additional workers. Yet defining specifically who is an Informatician, what they do, how to best train them and exactly how many individuals we need remains challenging. (6) It has become increasingly urgent however to train individuals in the skills required as the push to use HIT in a “meaning way” has accelerated on many fronts. These initiatives include the Patient-Centered Medical Home (PCHM), Quality and Safety initiatives, Computerized Physician Order Entry (CPOE), Health Information Exchange (HIE),

hospital information system integration, the push towards interoperability of healthcare information systems and efforts aimed at decreasing healthcare costs. Nearly every facet of our society is now calling for the appropriate use of HIT to improve quality and decrease costs within healthcare. Yet those professionals who have focused their careers in this area are warning that there are major challenges to overcome to achieve any of the laudable goals espoused. There are many recommendations that a clinician workforce that is well trained and supported by Informatics experts has the best chance of success. (7, 8, 9)

Family Medicine as a discipline has been at the forefront of the call for effective use of HIT with several high profile efforts, such as the Future of Family Medicine and TransforMed, underway to encourage our overall use of technology in a patient-centered manner that facilitates effective and efficient care. (10, 7) In particular it is clear from the leadership of Family Medicine that training our faculty, residents and students to better understand and utilize EHRs, PHRs, Disease Registries, Care Management Software and other forms of HIT is going to be a critical success factor to achieve the stated clinical care goals. (11, 12) Yet these tools are in constant development and are far from adequate in terms of features and usability, often requiring significant customization and refinement within the institutions they are installed in. Ideally this customization would involve the most informed and appropriate end-users. In our training programs this should be the faculty, who are often woefully unprepared for such a task. Then the optimum use of these tools needs to be discerned and taught to learners that vary from students to practicing physicians.

This requires effective teaching methods for our faculty in the form of faculty development and Continuing Medical Education (CME) programs that change the behavior of how clinicians use HIT in practice settings to improve clinical care. Creating this effective CME is a challenging task that involves choosing the correct delivery method, content and instructional design process. (13) Research that has examined how to best accomplish this for clinical knowledge and skills suggests that multiple exposure to materials in a variety of formats (print, multimedia, face to face, interactive and case-based) is most effective at imparting lasting changes in the knowledge, skills and attitudes that then can lead to changes in practice patterns. (14)

Yet we face the same dilemma as many other academic disciplines – how do we train our own very busy faculty to take the lead in developing appropriate curriculum when they lack the knowledge and skills required to do so? Faculty are in many instances motivated and eager adult learners who simply lack efficient means to achieve the Informatics skills that are needed to promote the future of care as envisioned by the leadership of the discipline. We know from the work of faculty development programs that improving teaching skills of faculty on a given topic follows similar principles for effective CME. In addition, since the desired long-term outcome is the development and delivery of effective curriculum for students, residents, clinicians and other faculty, a multi-stage process must occur for the faculty attendees of such a workshop. They must acquire the requisite knowledge of the subject matter, decide that it is appropriate to teach, determine effective methods of performing this education, develop curricular goals, objectives and

methods specific to their circumstances, deliver the educational intervention and evaluate its outcome. In order to best facilitate such a complicated process, a number of things need to be considered. Most already have the skills required to plan and develop curricula, but may lack appropriate knowledge about Medical Informatics and the skills in the use of the HIT tools they might be educating learners about.

It seems clear that a focused effort on helping current Medical School faculty acquire the knowledge and skills is prudent since it can dramatically expand the number of learners exposed to Medical Informatics principles in with what is perhaps the least effort since they are already developing and administering curricula as part of their daily work.

This workshop was designed to help fill these gaps by educating Primary Care faculty about Medical Informatics curricula and facilitating opportunities for learning and collaboration around creation of unique curricula for their home institutions.

### **Methods and Materials:**

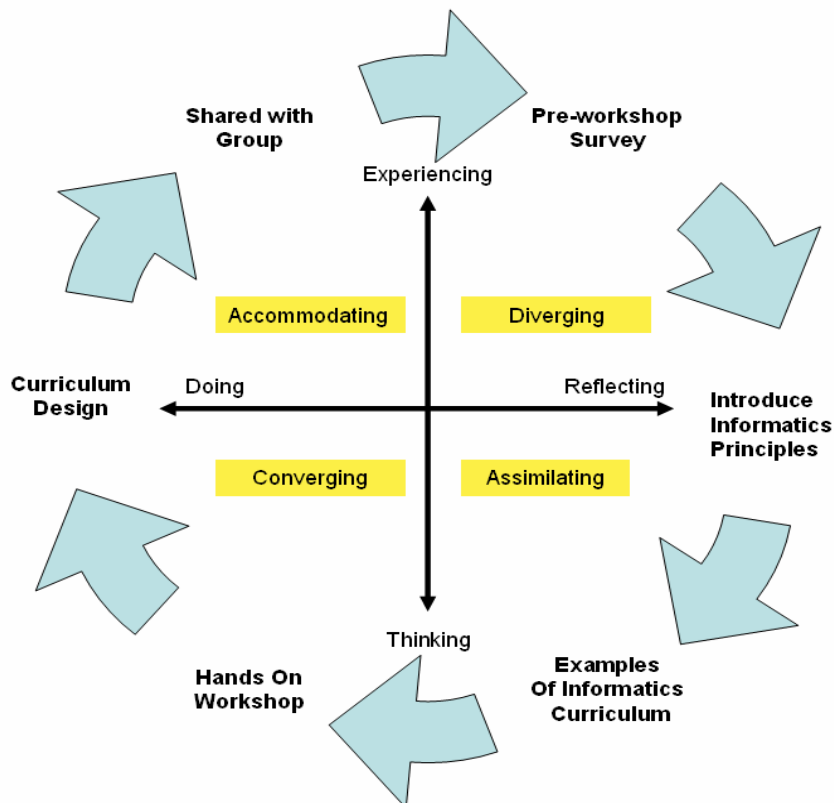
The rationale, outline, methods and budget for this proposed project were submitted for peer review and approval by the STFM Education Committee in the spring of 2007 and subsequently approved as one of three pre-conference workshops for the Annual Predoctoral Education Conference. This four hour afternoon workshop required pre-registration as well as an additional nominal fee for attendance and was limited to 25 participants in order to maximize opportunities for hands on learning. The list of registrants, along with their email was captured electronically at registration in order to facilitate planning for the actual workshop itself. Attendees were encouraged to bring a

wireless laptop computer and an idea about an element of their current that might be improved by adding or modifying it to incorporate medical informatics principles.

The overall strategy for the design and implementation of the event was driven by adult learning principles and modeled after a curriculum planning framework for Continuous Medical Education (CME) developed by Armstrong et al. This recognizes that most clinicians prefer active experimentation as part of their learning style and proposes sequencing tasks towards more active learning. The goals were to provide participants with a basic understanding of the principles of medical informatics and entice them to acquire some of the additional knowledge and skills necessary to incorporate these principles in Family Medicine curriculum for all levels of learners (students, residents and faculty). The organizers recognized that faculty attendees would likely need additional training to move closer to this goal, but we focused on demonstrating with examples, how these principles could be applied in a manner that enhanced medical education, then allowed them to practice, got them to identify specifically where in their own curriculum they could apply this and finally describe how they would accomplish it. From the outset best practice CME principles were followed to maximize desired outcomes. A review of the CME literature demonstrated these to include: doing a needs assessment, having a multifaceted intervention strategy, sequencing the CME events appropriately to facilitate change, creating interaction between faculty learners and the educators and materials, and soliciting a specific commitment to change their curriculum. (15, 12) An outline of the process overlaid on the curriculum plan is demonstrated by Figure 1. This figure is a modification of Armstrong's model of CME specifically

demonstrating the process we followed, overlaid on the framework of adult learning. We attempted to include all types of learning styles at different points in the experience by allowing attendees to have both experiential and reflective experiences. At the same time, the sequential process of the pre-survey to the various steps in the workshop facilitated logical progress towards the end goal of having attendees commit to some the creation of some Medical Informatics curricula at their home institutions. Dr. Agresta, the primary author has considerable experience teaching with and about technology in medical education, as well as using this sequential method of CME delivery.

**Figure 1. - Informatics Training Workshop Activities In Context of a Learning Theory – Curriculum Planning Framework (Armstrong)**



A brief online survey (See Appendix 1) of the registered attendees was done 2 weeks prior to the workshop for several purposes: to get a clear understanding of participants a) knowledge about Medical Informatics topics b) awareness of available educational resources regarding BMI c) perceived needs for curriculum development in their own medical schools and residency programs. This information was provided to workshop faculty in order to inform them about the audience and permit them to adapt their respective presentations to facilitate optimum learning for the audience.

Upon registering, workshop participants were informed that they should bring their own wirelessly enabled laptop computers as well as a curricular idea or problem that they wished to solve using Medical Informatics content or techniques in order to gain the most from the workshop. Some examples were provided during the online survey in order to prompt appropriate material selection and give participants a better idea of what might be covered during the several hours we would have together.

All workshop materials including presentations, resource lists and links, hands-on software for workshop learning, workshop objectives and curriculum worksheets were posted ahead of time on the Family Medicine Digital Resource Library (FMDRL) (<http://fmdrl.org>) This is an interactive searchable wiki-like repository open to all but intended specifically to facilitate access and sharing of high quality, peer-reviewed educational resources for student, resident and continuing medical education for Family Medicine Educators. The uploading allowed actual use by attendees of the FMDRL website during the workshop to view and download materials. More importantly however



it created a tactile knowledge of this resource they could easily find and use after returning to their home institutions. This permitted easy retrieval of materials when faculty attendees were actually ready to use them for continued learning and incorporation into curriculum design. This critical link between the act of learning and retrieval of materials at the time of need is often a substantial barrier to effective use of the knowledge and skills gained during a CME event.

### Workshop format and presentation

**Table 2 -Workshop Methods:**

Topic	Description	Responsible faculty
Pre-workshop activities	<ul style="list-style-type: none"> <li>• Online survey of knowledge, skills attitudes</li> <li>• Encourage attendees to bring curricular needs.</li> <li>• Preload materials onto FMDRL</li> </ul>	Agresta
Intro / Welcome	<ul style="list-style-type: none"> <li>• Introduced faculty and attendees</li> <li>• Reviewed goals / objectives</li> <li>• Demonstrated FMDRL wiki with materials</li> </ul>	Agresta
Workshop needs assessment review	<ul style="list-style-type: none"> <li>• Reviewed pre-conference needs assessment</li> <li>• Demonstrated how to use web survey tools</li> </ul>	Agresta
Informatics Competencies Review	<ul style="list-style-type: none"> <li>• AAMC Medical School Objectives</li> <li>• Family Medicine Resource Curriculum</li> </ul>	Blanchard
Define Informatics	<ul style="list-style-type: none"> <li>• Review definitions for Medical Informatics</li> <li>• Provide historical context for field</li> <li>• Review workforce needs and training options</li> </ul>	Hersh
Informatics Curricula for Medical Students	<ul style="list-style-type: none"> <li>• Review of four year Informatics curriculum for medical students at Florida State University</li> </ul>	Clark
Informatics for Quality Improvement	<ul style="list-style-type: none"> <li>• Demonstration of educational tools used in quality improvement education about for residents</li> </ul>	Dorr
What works in Informatics education	<ul style="list-style-type: none"> <li>• Success &amp; challenges with various educational methods and strategies for teaching informatics</li> </ul>	Gorman
Curriculum worksheet	<ul style="list-style-type: none"> <li>• Introduced concept of formal curriculum design with use of a structured worksheet for planning</li> </ul>	Agresta
Hands on session	<ul style="list-style-type: none"> <li>• Attendees access all demonstrated resources and tools via laptops in a mentored fashion</li> </ul>	All
Curriculum Design	<ul style="list-style-type: none"> <li>• Small group activity focused on designing a curriculum for home institutions.</li> </ul>	All
Wrap up	<ul style="list-style-type: none"> <li>• Review of small group activities and feedback</li> </ul>	Agresta

The workshop started with a welcome and introduction of all faculty and attendees, as well as a brief review of the goals and objectives by Thomas Agresta M.D. There was then a demonstration of the FMDRL including an overview of the features, layout and

purpose of this resource. Of the 25 attendees present only a handful had ever visited the site prior to the session. The specific workshop site and its layout on FMDRL were reviewed, including all materials and how to download them as needed and find this site in the future. An icon that had a URL shortcut pointing to the FMDRL site that was created prior to the workshop was loaded on each participant's laptop via a zip drive in order to facilitate rapid involvement throughout the workshop when needed.

A review of the answers to the pre-conference survey with that attendees provided them with a glimpse into the areas of Biomedical Informatics that they were collectively unaware existed, such Personal Health Records and Public Health Informatics topics such as the Public Health Information Network. The audience quickly noted that many of the potentially appropriate areas to educate clinical learners about were not covered in existing courses or seminars in their own institutions. The same Survey Monkey<sup>®</sup> web site that was used for data collection was used to review their answers to the survey. This process allowed us to directly demonstrate how they might accomplish a similar data collection for their own curricular purposes in the future. Participants were encouraged to log into the site themselves while watching the demonstration and to save the website in their favorites. Most attendees had not visited the site prior to the workshop and did not know how it functioned. With this simple demonstration of how we developed our survey, several attendees were able to identify ideas for their own curriculum planning.

Shawn Blanchard M.D. an Assistant Professor of Family Medicine at Oregon Health & Sciences University, then did a brief overview of the current Informatics competencies

developed by the Association of American Medical Colleges (AAMC) as part of its Medical School Objectives Program (MSOP) and those developed for the Family Medicine Resource Curriculum. The web locations of these resources had been posted on the FMDRL and users were encouraged to follow the links live while in the session and bookmark them for later return. Both of these guides were developed by academic faculty to assist in development of broad instructional planning for the four years of medical school. The informatics components are limited and primarily focused on helping learners with effectively mastering the information retrieval and interpretation skills needed for searching the primary medical literature. In addition more emphasis is placed on Evidence Based Medicine and its use at the point of care in the clinical environment by the Family Medicine Resource Curriculum. Each is also structured in its language such that there is a focus on developing and assessing learner competency with these skills. A discussion about the value in structuring curricular goals and objectives in this fashion, as well as the importance placed on basic informatics skills ensued. There was a discussion of the limited nature of these guides for informatics curriculum. We reviewed workshop faculty's concerns that they did not cover the majority of informatics competencies which might reasonably be considered appropriate for graduating medical students to acquire and demonstrate during training. As noted by the survey instrument though, a majority of attendees had never visited the websites for these guides and were unaware of their existence. (16, 17)

An overview of the field of Biomedical and Health Informatics was given in an informal lecture style format by Dr. William Hersh Professor and Chair of Biomedical Informatics

at Oregon Health & Sciences University and one of the educational leaders in the field. He reviewed its background and underpinnings and some of the common language used to describe the field. A review of the rationale for focusing some of our precious curricular time on these topics was accomplished by using several demonstrations of common situations occurring in our clinical settings such as the adoption and use of Health Information Technology (HIT) for managing patient care and the value of trained individuals in Informatics to successful and safe use of this HIT. There was an overview of the large number of Clinical Information Systems (CIS) and other HIT tools that remained to be deployed; updated and utilized effectively that need trained clinicians at all levels of skill to help in doing this in a safe and effective manner.

Next, a high level overview of a four year curriculum in Medical Informatics at Florida State University (FSU), a recently accredited medical school, was given by Nancy Clark M.Ed. This served as an example for workshop attendees of how informatics themes could be woven throughout the educational continuum. The curriculum is mapped to thirty nine informatics core competencies that were defined by FSU faculty and are taught in specified courses in a clearly defined sequence in the first three years of medical school with appropriate methods ranging from self running tutorials, to lectures, to interactive computer exercises to faculty delivered hands on workshops. These competencies are then reinforced in subsequent coursework with an expectation that students demonstrate competence through the practical use of the knowledge and skills acquired. The competencies are arranged into seven overarching themes which are: 1) Computer Literacy 2) Lifelong Learning 3) Research 4) Medical Reference 5)

Communication 6) Clinical Information Management and 7) Evidence Based Medicine. (18) Specific examples of curriculum delivery to students as well as faculty, through faculty development and Continuing Medical Education (CME) events, were discussed. Attendees were given access to the Informatics Competencies as well as the entire curriculum through the workshop specific FMDRL website.

Following this, David Dorr M.D. M.S. an Associate Professor of Biomedical Informatics from Oregon Health & Science University presented ideas about how to design a quality improvement curriculum for students and residents. He did this through demonstration of an informatics tools that is in use for clinical quality improvement can be used to both improve overall clinical outcomes as well as instruct learners about the principles of Medical Informatics for populations of patients. This presentation included an overview of some of the common elements of quality as defined by the Institute of Medicine (Safe, Effective, Patient-Centered, Timely, Efficient and Equitable). (2, 3) He then used different examples of how those principles might be incorporated into an overall informatics curriculum focused on quality improvement, showing how data capture, retrieval and display is critical feature of for this curriculum, while not specifically focusing on describing the informatics nature of the content. This use of a stealth delivery of curriculum is a common feature the presenters found effective. Some examples that were used included: 1) a meta-analysis about diabetes control that evaluated a large number of different interventions for effectiveness that included some Informatics approaches (19) and how that might be incorporated into discussions of improving diabetes outcomes 2) discussions of improved outcomes using paper based informatics

designed order sets for antibiotic management of pneumonia in patients in an emergency room and 3) regional and state level quality dashboards for consumers demonstrating best care outcomes for diseases as widespread as pneumonia and cardiovascular outcomes. Finally specific examples of how one might develop a curricular process that used these tools within the context of a Continuous Quality Improvement project for residents was explored.

Paul Gorman M.D. M.S. an Associate Professor of Biomedical Informatics and Medicine at OHSU and Chair of the AMIA Education Working group, then presented a “lessons learned” from the field discussion about what he and others had observed to be more and less effective in delivering Informatics curriculum to students and residents. This took on the format of an overview of what he and others had tried in curriculum delivery methods and a grade type rating of how effective they were at achieving the desired goals ranging from a C- for being a “Guru” who demonstrated technology to an A for a focused Informatics and Evidence Based Medicine two week rotation in the latter half of the second year of residency with dedicated one on one faculty time. Overall lesson themes were that personalized, focused curriculum that did not include Informatics specifically in the name and were given at a point of time when the learners most recognized the need for the learning and had the time and space to integrate the lessons into practical care of patients was the most effective method to promote best outcomes. He ended with a list of success factors that could be incorporated by the attendees in their own curricular planning that included: 1) making sure the rotation is faculty guided 2) ensuring that a specific focused task drives the rotation 3) demonstrating peer success models 4) having

the learners actually practice with useful tools 5) being supportive of learners specific needs 6) integrating medical content that learners need to learn anyway and 7) having explicit and specific curricular requirements and an evaluation method matched to measure this for each rotation.

Thomas Agresta M.D. an Associate Professor and Director of Medical Informatics of Family Medicine at the University Of Connecticut, then utilized an Informatics Curriculum Worksheet (See Attachment 2) that had been previously supplied to attendees to review common principles of effective curriculum design with a specific emphasis on teaching Informatics Principles. The worksheet had several different sections that were designed to facilitate Family Medicine Faculty to carefully plan for a specific modification to an existing course or to develop new curricular offering. It included the following general headings: 1) Name, Institution and Role 2) Identification of the intended audience 3) a prompt for the faculty to review the current skills and knowledge of the learners about the topic planned and how they had identified this (Computer literacy and Informatics) 4) an outline of goals and objectives for the planned curriculum 5) a survey of resources required 6) a review of the intended methods and tactics to be used for curriculum delivery and finally 7) a reminder to design an evaluation strategy.

Attendees were then broken into small groups and given the opportunity for a hands-on trial of a number of Informatics Resources provided to them via the FMDRL wiki (See Attachment 3) with help and oversight by the workshop faculty. The majority of attendees had wireless laptops with them and used these tools, while approximately 8

attendees required access at centrally located desktop computers with internet connections provided by STFM staff specifically for this occasion. This session lasted approximately 45 minutes and workshop faculty rotated between groups to permit attendees to access the particular expertise of each presenter. Attendees were instructed prior to this exercise to explore some sites that they felt would directly benefit their particular needs as well as to view sites / resources that they had no prior experience with, but felt that faculty facilitation would broaden their knowledge and skills with use. Some of the sites were specific to curriculum development in Informatics, while others actually contained interactive experiences, such as a Mock Disease registry, that could be used directly as a teaching tool, or could be modeled for alternate teaching purposes. A reminder was given to each participant that all materials would remain available for them electronically on the FMDRL.

After this exercise attendees were reconvened and split into groups of three to four for 30 minutes to utilize what they had learned during the workshop to begin to develop a curricular plan for incorporating Medical Informatics principles within either new or existing rotation experiences for students, residents or faculty learners. They were instructed to use the Curriculum worksheet reviewed to complete this task. Workshop faculty moved throughout the rooms, remaining available as a resource to the various groups. Groups continued to have access to on-line materials and were able to use them as needed for curriculum development. After this process all groups chose a spokesperson who briefly reported to all attendees the major components of what they worked on. Some groups had made significant progress, outlining a full set of goals,



objectives, methods and resources, while others had remained focused on learning more about the available resources to develop future curriculum.

**Results:**

*Summary:* The workshop itself was designed with a number of opportunities to evaluate the intended outcomes in both formal and informal ways. The one desired evaluation that was not possible was a long-term impact analysis of if and how the workshop changed attendees' use of Medical Informatics principles directly in their own curriculum as a result of attending this particular event. Proxy methods of evaluating an intermediary to this outcome are employed within this discussion.

The workshop itself was deemed to be an overall success on many levels. It was well attended with more requests for registration (40) than slots available (25) and all registered guests attending except one, who was replaced by a standby registrant for a total of 25 attendees. The afternoon itself went smoothly with all technical components working without problems, an often challenging situation for workshops, presentations or other teaching methods so reliant on multimedia, varying internet connections and the different operating systems of laptops etc. Overall feedback from attendees and staff from STFM was positive, with comments about the quality of presentations, opportunity to have hands-on mentored experience with Informatics resources and tools and a chance to collaborate with colleagues from other institutions on curriculum design listed as major positives. There were some concerns raised about the time allocated to different activities with a desire expressed for more time in the hands on and curriculum design phases.

***Pre-Conference Survey results:***

A survey was sent via email to the registered attendees two weeks prior to the workshop, with a reminder sent one week in advance of the workshop. A total of 18 out of 25 attendees answered all or part of the pre-conference survey that was posted on Survey Monkey which represents a 72% response rate. For a full accounting of survey results see Appendix A. In general the majority of respondents were either Predoctoral faculty or directors (72%) with a small number of residency faculty (6%) and a few who identified themselves as Informatics Faculty (16%). Faculty attendees had an overall perception of Medical Informatics as being the applied use of computer applications, technology and tools for patient care, education and research. While this represents an accurate subcomponent of what Informatics is, there was an under-appreciation for the Information management and human factors components of Medical informatics. The lack of understanding of these components was borne out in the verbal comments and discussion that occurred during Informatics definitional discussions led by Dr. Hersh and others at the workshop.

Most respondents (56%) noted that they were not involved in Informatics education, while others had some experience teaching about quality improvement (25%), or were involved in Informatics activities not directly related to education such as an EHR selection or a Clinical Decision Support committee (18% for each). Still other faculty were individually involved in efforts as far ranging as a Clinical Translational Science Award and were intimately aware of the research components of Informatics. No

respondent indicated they were involved in more than two of these activities. Most institutions do not have formal Informatics curriculum, but rather have it inserted in an unplanned haphazard manner (63%). Some have specific courses with titles of Informatics in their first or second years of medical school that are more focused on Information Retrieval from PubMed and other literature sources. A few (less than 13%) had required or elective experiences specifically dedicated to Medical Informatics.

Of the 60% of respondents that stated there were specific goals and objectives for Medical Informatics within their curriculum, it was clear that most of these were related to correct usage of either an Electronic Medical Record or related to Information Retrieval and Evidence Based Medicine. It was clear that of the broader range of Medical Informatics topics that were discussed in the workshop, most were either not taught explicitly in Medical School or residency, or the attendees were not aware if they were discussed elsewhere in the curriculum. The only topics that received widespread coverage were information retrieval and Evidence Based Medicine, typically being taught in both Family Medicine and elsewhere in the curriculum.

When queried as to what they wanted from the workshop approximately a third of respondents did not know what to expect (31%), while the others desired to learn about specific curricular goals and objectives (65%), and knowledge of Informatics tools and resources (43% and 50% respectively). A smaller but significant percentage also wanted networking opportunities and the possibility of developing inter-institutional curricula.

***Formal Attendee Feedback:***

STFM collected formal feedback from attendees who chose to submit the forms required. As is often the case for these conference sessions, there were a limited number of individuals (six out of twenty five) who returned formal feedback forms for a 24% response rate. The primary author received these forms approximately one month after the session and the following is an overview of the content, averages and range of responses received. In general the average response received anonymously from these six respondents was somewhat more critical of the methods and content of the workshop than the informal comments received directly after the session, but there were some very constructive comments that would be useful in formulating future events. It should be noted that the feedback was submitted by a more experienced group of faculty with an average number of years being faculty of 7.33 (range 4-8 years) versus the typical attendee at a Predoctoral Education conference which ranges from 1 – 20 years but averages approximately 5 years (STFM internal communication).

A Likert scale was used for all 8 multiple choice questions with the anchors being labeled as follows: 1 representing strongly disagree, 3 being neutral and 5 being strongly agree. Table 3 shows the questions asked of all attendees at STFM events and what the range and average responses were for the six respondents.

**Table 3 - Formal Feedback from STFM forms**

Question	Range	Avg
The title & description of the workshop representative of its content and methods.	2 - 5	4
The information presented during this workshop was Useful and Transferable to your own institution and setting.	1 – 5	3.7
The content and methods used were innovative.	3 – 5	3.7
The workshop faculty had an effective style.	3 – 5	3.7
The speakers were knowledgeable about the content presented.	4 -5	4.8
The speakers were well prepared for the session.	4- 5	4.6
The handouts and materials provided were of high quality and value.	3 – 5	4.2
Overall the session was of high value for you in your current faculty role.	2 -5	3.7

Freeform comments were solicited as part of the standard STFM feedback form and are shown below in Table 4.

**Table 4 - STFM Feedback form - Comments from attendees**

Question	Summary of comments received
How could this session be improved?	<ul style="list-style-type: none"> <li>• Participants were mostly novices, faculty were experts – too much expected with regards to curriculum development</li> <li>• Small group sessions could have been better organized with clearer instructions</li> <li>• More interactive time</li> <li>• The time for people to “look on their own” lost some focus – another method could have been used</li> <li>• Mix didactic with hands-on session in a more seamless fashion</li> </ul>
What new Knowledge did you gain?	<ul style="list-style-type: none"> <li>• Learned what Informatics is.</li> <li>• Each speaker had some useful information. The topic of Informatics is broad.</li> <li>• The informatics competencies were useful</li> <li>• Resources for integrating Informatics into Curriculum</li> <li>• Better understanding of tools / uses</li> </ul>
What are your general comments about the session?	<ul style="list-style-type: none"> <li>• Best part of session was having laptops present – could do other things as well as conference (such as checking email)</li> <li>• Dr. Agresta did a pre-conference survey, but did not adjust the workshop enough to fit the needs of the attendees.</li> <li>• Chronic Disease improvement such as Diabetes Mellitus / need management teams.</li> <li>• I will pick and choose the best from all the lectures.</li> </ul>

Despite the small number of responses there were some overall themes that can be used to improve future presentations and workshops. These themes include: 1) The desire of attendees to have a more seamless intermixing of the interactive and didactic sessions in the future, including possibly having some hand-on time during each short didactic

session rather than a whole section of the workshop dedicated specifically to this process. 2) Interactive time with other faculty is a valued opportunity to share best practices and should be expanded at the expense of more didactic style education. 3) A broad topic such as Biomedical Informatics may be too much for one workshop and perhaps the focus should be on either areas that attendees were not familiar with, or that they expressed an interest in during the pre-survey results. 4) If you collect information about what attendees need or want out of an experience prior to the session they will generally expect you to use that information to develop the workshop, even if their responses differed from that of others within the group.

In reviewing the answers it was clear that one respondent of the six did not feel that this pre-conference workshop met their needs and was vocal in his or her responses that this was the case. It is hard to make more robust judgments about the feedback provided given the sample size and the ability for one respondent to skew results in either a positive or negative direction very easily. If the response rate had been 15 to 20 attendees a more valid understanding of the overall value of the workshop could have been ascertained. None-the-less the generalizations about the comments made above likely hold true, even across a larger sample size and can be used for future event planning.

***Downloads of materials on FMDRL to date:***

There materials continue to be available for public download from the FMDRL website and a recent review of the statistics of this particular site showed a robust number of retrievals for each of the workshop materials present on the site. It should be noted that

there are approximately 1200 registered users of FMDRL (Internal STFM correspondence) at this time, the vast majority of whom are Family Medicine faculty and are also STFM members. All attendees at the workshop were STFM members and all had a role in educating medical students and belonged to the Predoctoral Education Working group of STFM, which totals approximately 400 members. The materials can be accessed in a number of ways from this website: from a freeform search to a keyword search, to a search filtered by type of presentation (workshop, lecture/discussion etc.). This website is also indexed by Google and other search engines so it is possible to find materials here on a broader internet search.

The materials have been downloaded a varying number of times (See appendix 3 with pictorial display of download status) from a low of 143 times for a zip file with healthcare quality examples, to higher volume downloads of 242 times for an Informatics links document and 253 times for the presentation by Dr. Hersh on what is Biomedical Informatics. This compares favorably with other materials on the FMDRL which average downloads in the range of 40 to 100 times for pre-conference workshops, up to a high of over 3,000 downloads for a plenary speech at a major conference.

**Discussion:**

***There is a Demonstrated Need for Additional Training:***

An overall assessment of this workshop and the needs identified and met suggested a successful first attempt at this content within the STFM audience. The high attendance and overbooking, along with the responses received both informally and formally

validated the need for education about Medical Informatics specifically focused on Family Medicine and other Primary Care faculty. The emerging need to manage information as part of routine clinical care to improve quality, efficiency and reimbursement is becoming evident to even the most casual faculty, resident and student observer. The recently announced Stimulus dollars to fund incentives for Medicare and Medicaid providers to achieving Meaningful Use of Health Information Technology (HIT) is only going to fuel the fire even more. This can be demonstrated by the numerous job opportunities for individuals trained in Medical Informatics who are Medical Faculty.

(20) In addition the Patient Centered Medical Home movement and the focus on Accountable Care Organizations will also drive effective use of HIT. All of these forces will mean that our learners (students, residents and faculty CME recipients) will need more education about the applied principles of Medical Informatics. In order to meet the demand, a cadre of well educated faculty needs to emerge. Given the paucity of Informatics faculty and the demands on their time it will require the targeted education of already existing faculty in a train the trainer model so that they can develop most of the lessons and curriculum needed as part of their routine teaching responsibilities. It will also require Academic Institutions to thoughtfully institute policies that increase the size of available trained faculty, such as the creation of Biomedical Informatics Departments, Divisions and Units, explicitly focused on some of these tasks. (21, 22) Using workshops like this one, with hands-on applied learning has been proven to be one of the more effective ways to provide CME to physician faculty and will likely be one of the most efficient ways to provide this targeted training in the future.



***Faculty Desire and Succeed at Learning New Skills if Appropriately Designed:***

We know from the literature and the prior experience of the author that many faculty, even those in the middle of their careers, are open to life-long learning and will change the focus of their research and education given the right conditions. (23, 24) Some of these requirements include support from institutional leaders, well formed faculty mentoring programs and internal reward systems aligned with taking on the risks associated with additional training and career shifts. (25, 26) It will also be important to explicitly focus some of this training on the newer faculty who arrive at the institution, who will likely have a greater overall skill using technology tools, yet may not understand the implications of Informatics as a discipline. These faculty members, having grown up in the age of computers, often take for granted the quick easy access to the tools of informatics, and more readily accept their use, but often do not fully appreciate their limitations. They also are more apt to desire on- the job training and to seek that out in E-Learning environments. (27, 28) As can be seen from the initial evaluations of the AMIA 10X10 program, there were a number of academic faculty who took the time and effort required to take a ten week certificate level course on Biomedical Informatics. (29)

***Lessons Learned:***

We noted that it is difficult to use pre-workshop survey results that are received within a week of the actual workshop to modify the content or process of the actual workshop. A more refined way of seeking input prior to the event needs to be developed. Perhaps a survey that cuts across multiple members of the STFM, which solicits feedback about

educational needs and preferred methods of learning, would be a better approach. While this is not specific to the audience that will attend an event, it permits a longer and more detailed planning process to occur. This should be carefully considered as a more thoughtful and well designed educational process could benefit a larger audience more efficiently. In future planning, it should be understood that a four hour period of time is not enough to adequately review a wide topic such as Medical Informatics and a more focused approach should be undertaken for more limited timeframes in future events.

Additionally, more time spent in hands-on interactive sessions is valued by the physician faculty attendees and is a validated preferred learning style for most physicians. This could be accomplished by requiring each presenter to incorporate a short, required hands-on component to their individual sessions that reinforced the concepts being discussed. In addition, more time should be devoted to faculty facilitated interactive curriculum planning, perhaps even using an online tool that attendees could access in the future via a social networking type of platform. The FMDRL has the capacity to allow small groups to continue to collaboratively and iteratively work on projects in this manner. Perhaps a virtual, inter-institutional Informatics curriculum development team can be supported in this manner that reinforces what is started in a brief workshop setting. A learning collaborative such as the one envisioned in this discussion has been shown to be effective in other settings to help facilitate teachers to make improvements to their own curricular content and methods. This is particularly true when they are moving out of their specific area of expertise or their comfort zone. (30)

***Additional Experience with Workshop Methods:***

Dr. Agresta had the opportunity to lead another faculty development workshop on Informatics Curriculum as part of the 2010 Northeast Regional AAMC meeting. (31) This was a shorter ninety minute version attended by 25 faculty from throughout the New England and Middle Atlantic region and therefore had much less didactic time available to review the overall topics of Medical Informatics. The materials were similarly made available on the FMDRL wiki for attendees. Much of the same resources were utilized during this workshop, but were covered in limited depth with expectations to do self review of materials after the formal workshop ended. No pre-survey was done and approximately 40 minutes of the total time was spent in direct small group interactions using a slightly modified Informatics Curriculum Worksheet. The session was considered successful by informal and formal feedback received, but the expectations were likely less given the time constraints available. There was some feedback given that perhaps short video clips of effective uses of technology in a patient-centered manner and use of other Informatics tools would enhance the learning experience after the workshop finished.

**Conclusion:**

There remains a significant and vibrant need for continued education of our students, residents and faculty in Medical Informatics. This can perhaps best be accomplished by focused faculty development, tied to professional meetings that these individuals normally can be expected to attend. The train the trainer model is likely to be best suited

to this group, with a significant portion of the training sessions being action oriented and hands-on. Creation of a learning collaborative should be specifically planned for as part of this process if at all possible to support faculty in actually carrying out their proposed curriculum changes in their challenging home environments. There should be a limited expectation that most of these faculty will enroll in a more formal training or certificate program such as the AMIA 10x10 or other training programs given the significant time pressure they face between clinical and educational duties. Future sessions should have more formal evaluation metrics, including a follow up in several weeks to month's time to discern whether the intended impact occurred to Informatics curriculum design and implementation.

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# Attachment 1

## Results of Pre-Survey for Medical Informatics Pre-conference Workshop

What is your primary role in Family Medicine Education?		
Answer Options	Response Percent	Response Count
Predoctoral Director	44.4%	8
Residency Director	0.0%	0
Predoctoral Faculty	27.8%	5
Residency Faculty	5.6%	1
Chair / Vice Chair	0.0%	0
Education Faculty (PhD educator)	5.6%	1
Informatics Director	16.7%	3
Research Faculty	0.0%	0
Resident	0.0%	0
Student	0.0%	0
Other (please specify)		6
<i>answered question</i>		<b>18</b>
<i>skipped question</i>		<b>0</b>

**Other responses included:** Predoc faculty, Associate Dean for Rural Health, Clerkship Director and Project manager

## How would you define Medical (or Health) Informatics?

### Answers

Intersection of computers, human behavior and health

accessible reliable information to assist in the clinical care of patients and the improvement thereof.

Information technology used for documentation, communication, point of care assistance, population management. etc.

computer applications used in health/medical care, hopefully to improve physician performance and patients' health outcomes.

1) Education - most all lectures, handouts, etc on-line 2) EHR in most all teaching sites and developing ways to use the EHR as a teaching tool 3) all students have requirements throughout the 4 years of medical school to participate in EBM activities

The use of electronic resources to help care for patients and solve medical/clinical questions.

using computers/PDA's to improve patient care

Using the internet to obtain up to date medical information to help guide medical practice.

Use of computer technology and software databases to enhance education, training and patient care

A necessary tool for helping care for patients in a more complete manner.

A necessary tool for more complete patient care and better research abilities.

Using technology to manage medical information

The application of computer technology in health care systems to improve efficiency, quality, safety, and portability.

The art/science of gathering, maintaining, retrieving and distributing medical information

Involves use of EHR, point of care access to health information and more

A web based resource of Health Information for patients and health care professionals.

*answered question*

16

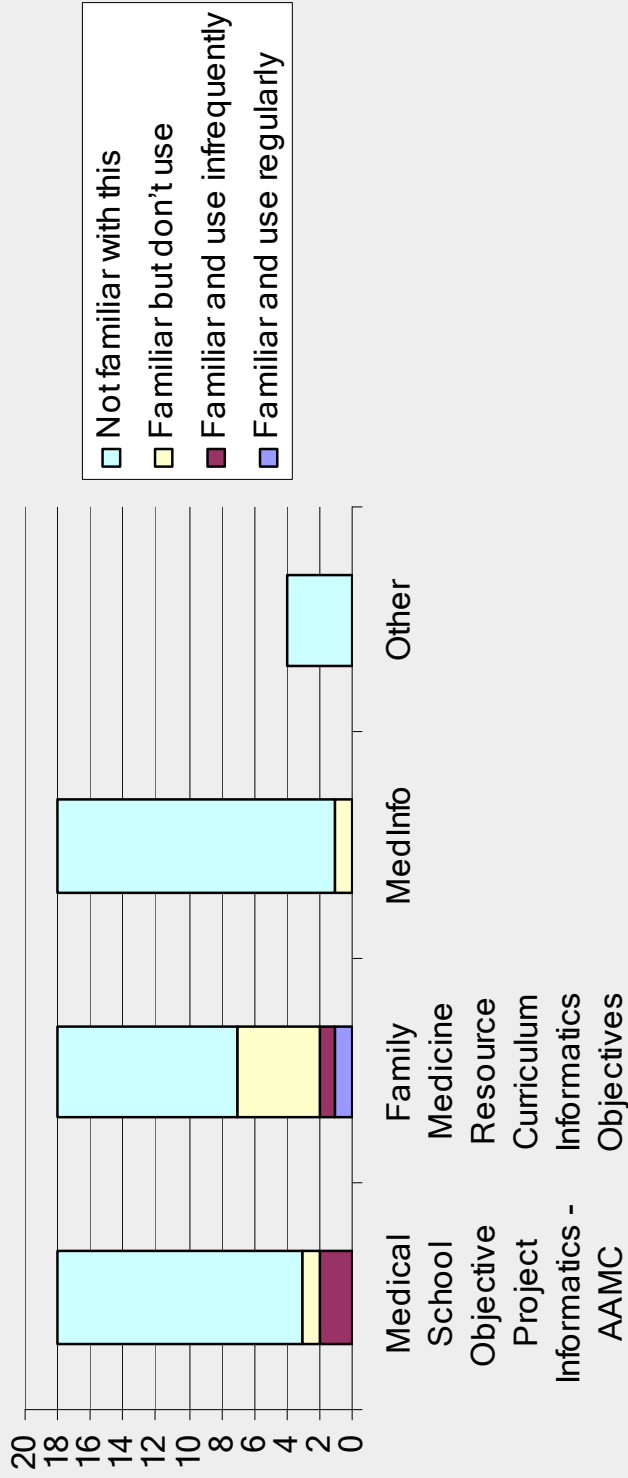
*skipped question*

2

Are you personally involved in Informatics efforts in your institution? Choose all that apply		
Answer Options	Response Percent	Response Count
Not at all	56.3%	9
Teach specific informatics sessions/courses	18.8%	3
EHR selection, maintenance or education	18.8%	3
Computerized Physician Order Entry team in Hospital	0.0%	0
Clinical Decision Support in Hospital or Office setting	18.8%	3
Quality Improvement team - Using Informatics tools	25.0%	4
Other (please specify) <b>TEXT ANSWERS FOR OTHER</b>		6
<p>CTSA efforts</p> <p>We use an EHR (user-un-friendly). Our sites are moving towards EHR and want to be able to work with students in pre-clinical and clinical years re how to use the systems</p> <p>See the importance of teaching student how to use all aspects of the computer for patient care, InfoRetreiver, PDA's, Use in the clinic, and Patient communication</p> <p>We want to teach Med student about its use.</p> <p>interested in incorporating it more into medical education</p>		
	<b>answered question</b>	<b>16</b>
	<b>skipped question</b>	<b>2</b>

How is informatics education organized in your institution? Choose all that apply.		
Answer Options	Response Percent	Response Count
Specific courses - such as Medical or Clinical Informatics	31.3%	5
Haphazard experience based learning - use of clinical tools such as Computerized - Order Entry on the hospital wards and EHR use during outpatient	62.5%	10
Some specific knowledge and skills taught during the pre-clinical years	43.8%	7
Some specific knowledge and skills taught during the Family Medicine or Primary Care Clerkship	37.5%	6
Fourth year selective or elective opportunities	12.5%	2
Required residency education series	12.5%	2
Optional residency training / elective	6.3%	1
Informatics fellowships (Primary Care Informatics, National Library of Medicine Fellowship, Other)	0.0%	0
<b>answered question</b>		<b>16</b>
<b>skipped question</b>		<b>2</b>

**Are you familiar with the following Nationally Endorsed Informatics Curricular Objectives? Choose the appropriate answer**

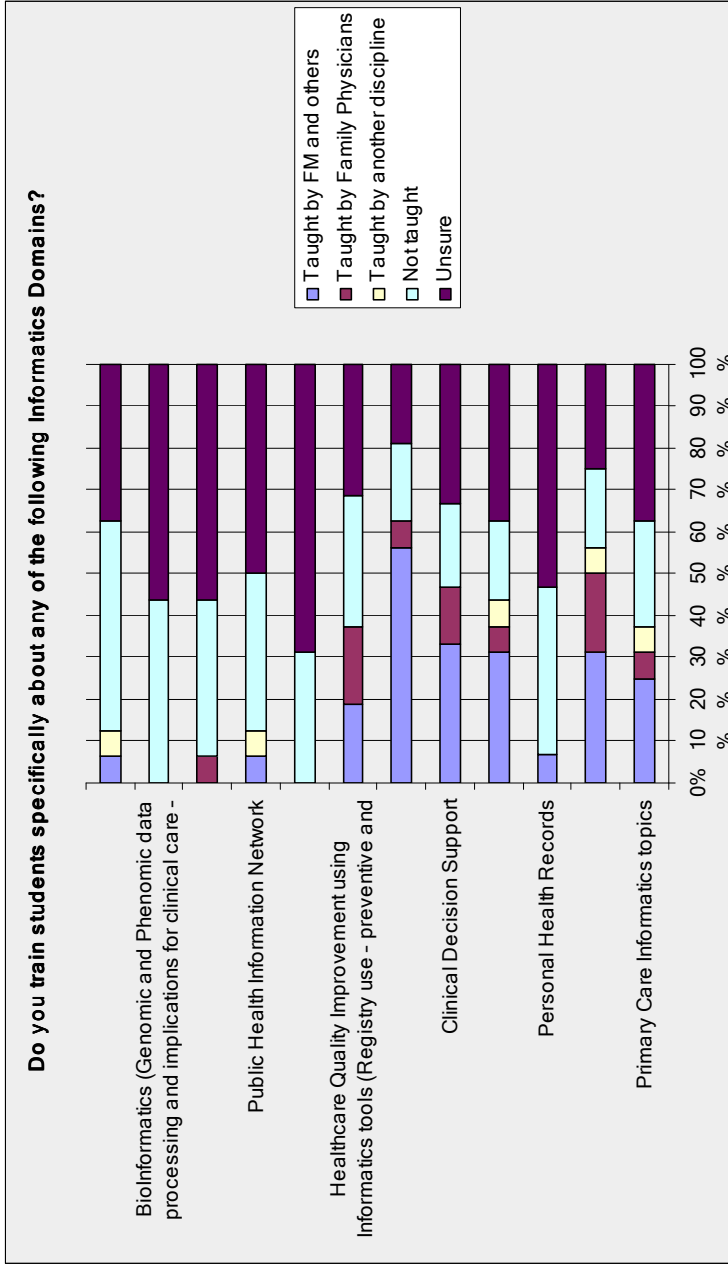


Do you have specific curricular goals and objectives that relate to Health Informatics		
Answer Options	Response Percent	Response Count
Yes	60.0%	9
No	40.0%	6
<p>If Yes please briefly describe them <b>Text Descriptions of Curricular Goals</b></p> <p>Supplementation of campus based learning to community sites, Data collection re: performance of students, sites, preceptors, as well as tracking student involvement in dept activities over time.</p> <p>Choosing an EHR for our student free clinic.</p> <p>1) Enable students and faculty to understand what can and cannot be expected from an EHR 2) Facilitate students and faculty obtaining maximum benefits and minimal trauma when using an EHR or other electronic informatics sources 3) (For myself) having a good sense of where to get on-going information to help me teach students (and myself) skills necessary to be a "savvy" user of EHR and other electronic tools/resources working to obtain EHR in office, hospital moving toward electronic physician order entry</p> <p>1) Illustrate the process of searching the medical literature or utilizing other medical informatics tools to answer a clinical question. 2) Demonstrate and use electronic medical records to improve the health care of patients.</p> <p>Be able to translate relevance to learners ie students and residents and junior faculty</p> <p>My assistant had developed a 4 year curriculum</p> <p>How best to incorporate informatics into the curriculum in a systemic way - both our clerkship, and across the 4yrs.</p>		
	<b>answered question</b>	<b>15</b>
	<b>skipped question</b>	<b>3</b>

Do you train students specifically about any of the following Informatics Domains?						
Answer Options	Unsure	Not taught	Taught by another discipline	Taught by Family Physicians	Taught by FM and others	Response Count
Primary Care Informatics topics	6	4	1	1	4	16
Use of Electronic Health Records	4	3	1	3	5	16
Personal Health Records	8	6	0	0	1	15
Computerized Physician Order Entry	6	3	1	1	5	16
Clinical Decision Support	5	3	0	2	5	15
Use of tools for Information Retrieval (EBM tools etc)	3	3	0	1	9	16
Healthcare Quality Improvement using Informatics tools (Registry use - preventive and chronic disease, Dashboards, Point of Care Decision Support)	5	5	0	3	3	16
Telemedicine and Home Health Monitoring	11	5	0	0	0	16
Public Health Information Network	8	6	1	0	1	16
Regional Health Information Networks and National Health Information Network	9	6	0	1	0	16
BioInformatics (Genomic and Phenomic data processing and implications for clinical care - personalized medicine)	9	7	0	0	0	16
Clinical Translational Research Informatics topics	6	8	1	0	1	16
Other (please specify)						2
<i>answered question</i>						<b>16</b>
<i>skipped question</i>						<b>2</b>



## Graphical Representation of Above Question – Demonstrating variance across answers



What do you hope to gain from this workshop - choose all that apply		
Answer Options	Response Percent	Response Count
Specific curricular ideas for implementation	68.8%	11
Curricular goals and objective ideas	62.5%	10
Informatics tools that I can use for education of students and residents	68.8%	11
Informatics resources for personal development (courses, web sites, texts and journals)	43.8%	7
Informatics resources to share with students and colleagues	50.0%	8
Networking opportunities	37.5%	6
Co-develop inter-institutional courses	25.0%	4
Not sure what to expect	31.3%	5
Other (please specify)		2
<b>Text Answers for Other</b>		
even if some of this is accomplished, I will be appreciative....		
i have convened an inter-institutional NY network which might be a good place to try some inter-inst course development if they do not already have pieces in place.... overview of medical informatics		
	<b>answered question</b>	<b>16</b>
	<b>skipped question</b>	<b>2</b>

## **Attachment 2**

**Family Medicine And Informatics Education,**

**Rising To The Challenge To Teach Students To Care for Patients In The Information Age**

Predoctoral Pre-Conference Workshop 2008

Worksheet for Curriculum Development

*Thomas Agresta MD, Shawn Blanchard MD, Nancy Clarke MS, David Dorr MD,*

*Bill Hersh MD, Paul Gorman MD*

Name:

Institution:

Role:

What course (s) are you thinking about modifying or starting to include informatics?

Who is your audience?

*(CME, Faculty Development, Residents, Medical students on Family Medicine Rotations, Students on other rotations)*

What are their basic computer skills? (Should you do an inventory?)

*Limited computers skills, Use clinical Information systems in hospital settings, Use Handheld computers to access databases, Use library resources to access online databases and texts (Many faculty), Advanced user of programs and resource searching (Many students / residents ), Use of EHR / CPOE systems – but little understanding of underlying principles, Good understanding basic underlying Informatics principles  
Expert users and excellent understanding of Informatics principles*

What is their starting knowledge and skills regarding Informatics?

How do you know? *(Prior experience working with them, Survey that you have done, other)*

Describe 1 to 2 major goals for this course:

Describe 3 instructional objectives - Try to make them specific, achievable, measurable, time limited and competency based.

*(You can pick from FMRC, MSOP or others examples to get started)*

What are at least 3 or more resources that you will use? *(Texts, courses, websites, Informatics tools)*

Describe how you will use them: *(Demo – then learners required to use on own, list of resources available learners self use, all use at same time etc...)*

How will you evaluate effectiveness of the course? *(Learner competency test, direct observation, peer report, need to use tools to complete project or exam, use in clinical care or OSCE simulation)*

# Attachment 3

## FMDRL – Informatics Workshop STFM Predoctoral Conference



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### Family Medicine and Informatics Education: Rising to the Challenge To Teach Students to Care for Patients in the Information Age

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David Dorr MD  
Paul Gorman MD  
Shawn Blanchard MD

Submitter: **Thomas Agresta**



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