Development of a primary care physician task list to evaluate clinic visit workflow

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ABSTRACT

Background: Interventions designed to improve the delivery of primary care, including Patient-Centered Medical Homes and electronic health records, require an understanding of clinical workflow to be successfully implemented. However, there is a lack of tools to describe and study primary care physician workflow. We developed a comprehensive list of primary care physician tasks that occur during a face-to-face patient visit.

Methods: A validated list of tasks performed by primary care physicians during patient clinic visits was developed from a secondary data analysis of observation data from two studies evaluating primary care workflow. Thirty primary care physicians participated from a convenience sample of 17 internal medicine and family medicine clinics in Wisconsin and Iowa across rural and urban settings and community and academic settings.

Results: The final task list has 12 major tasks, 189 subtasks, and 191 total tasks. The major tasks are: Enter Room, Gather Information from Patient, Review Patient Information, Document Patient Information, Perform, Recommend / Discuss Treatment Options, Look Up, Order, Communicate, Print / Give Patient (advice, instructions), Appointment Wrap-up, and Leave Room. Additional subcodes note use of paper or EHR and the presence of a caregiver or medical student.

Conclusions: The task list presented here is a tool that will help clinics study their workflows so they can plan for changes that will take place because of EHR implementation and/or transformation to a patient centered medical home.

INTRODUCTION

Primary care is considered the hub of healthcare delivery for patients.[1] The provision of high-quality and safe care in primary care has not been ideal; hence, there are global efforts underway to improve care quality.[1–4] Many health systems and clinics use quality improvement techniques to optimise clinical workflows to improve care. In the USA, a major effort is underway to change the structure of primary care delivery through the Patient Centered Medical Home (PCMH) initiative.[5 6] Electronic health records (EHRs) have been implemented across primary care in many countries[7–9] and are destined to become a fixture in all US primary care clinics over the next 5 years given the recent HITECH legislation incentivising their implementation and meaningful use.[10] While these technologies have the potential to revolutionise healthcare delivery through improved access to patient information and communication and the provision of clinical decision support, evidence of the effectiveness of health IT is mixed, at times falling short in achieving improvements in the quality and safety of care delivery.[6 11–15] One of the main reasons for the mixed evidence relates to whether and how the health IT was integrated into clinical workflows, or the flow of clinical work through space and time.[16–18] However, there are a limited number of tools available to assist healthcare professionals and organisations in understanding their individual workflows. To maximise the utility of health IT and quality improvement efforts, primary care clinics need a tool to analyse their workflow so that they can proactively plan for these changes. The first step in developing such a tool is to determine the specific, but generic tasks that get done in clinics so that those interested in studying their workflow have a template of tasks from which to work. Workflow analyses using task lists have been performed in a variety of other healthcare settings, such as hospital medical/surgical

and intensive care units, and delivering anaesthesia in the operating room.[19–22] However, a task list does not yet exist to allow us to perform in-depth analyses in the primary care ambulatory setting.

Therefore, the goal of this study was to develop a comprehensive but generic list of primary care physician (PCP) tasks that occur during a face-to-face patient visit, which can be used as a workflow evaluation tool by healthcare professionals and organisations. We focused on visit workflow because it is arguably the most critical point in physician workflow. Importantly, when developing such a task list, the goal is not to evaluate the flow for best methods or produce the definitive list, because in healthcare that may not be possible. Tasks vary by available technology, physical layout, staffing, local cultures, country of practice and even clinician to clinician. Each study developed a tool from local data and then used it to analyse local workflows. Therefore, the goal is to create a comprehensive and useful tool that can be leveraged and modified by others to study their unique workflows. Our goal was to develop such a task list by studying a wide variety of primary care practices.

METHODS

Setting and participants

This study uses data from two US observational studies of primary care work (table 1) in which each study team collected task and workflow data using similar data collection methods. The first study evaluated the care of elderly patients in 15 primary care clinics in Wisconsin, enrolling one physician per clinic. Observations of patient care delivery, that is, the physician–patient clinic visit, were completed at 14 of these clinics. The second study evaluated three clinics, from which all physicians and physician assistants in the clinic were invited to participate. A total of 16 physicians and two physician assistants were enrolled with only one physician not participating. Because this paper focuses on physician work, the physician assistant observations were excluded from this data analysis (the work of physicians and physician assistants may be systematically different due to training). Physicians in both studies represented family physicians and general internists. The Wisconsin Research and Education Network, the Wisconsin primary care based research network, was used to recruit primary care clinics for both studies. There was no overlap in the study clinics. Both studies intentionally recruited clinics with and without an EHR system and in rural and urban locations. The study was approved by the investigators' institutional review board and, when necessary, by the primary care clinic's own institutional review board.

Data collection

Observations in both studies were performed from March 2008 to March 2009. The goal of the observations was to collect data on the processes of care and work performed by clinicians. Data were collected by one human factors engineer (J.L.) in study 1 and by one human factors engineer (G.H.) and one human factors trained physician (T.W.) in study 2. Prior to data collection, all observers were trained in observation data collection and followed a protocol of what to record from the observations based on the Systems Engineering Initiative for Patient Safety model of the work system in healthcare.[23] Observers recorded, in as much detail as possible, information about:

1. The tasks being performed by the physician during the clinic visit.
2. The care delivery environment, for example, the physical layout of the exam room.
3. How the patient and physician interacted with each other and any other person involved in the clinic visit, for example, patient care giver or nurse.
4. The technology or tools that were used by the physician, patient or others involved in the visit, for example, the EHR, charts, forms, patient notes.
5. Details about the organisation, for example, the structure of healthcare teams, policies and procedures governing task performance.

Observation notes were taken free-hand during the visit and transcribed as soon as possible after the observation. Private health information was not recorded. Similar data were collected across both studies. For the purposes of these analyses, each physician–patient observation was given a unique code. An observation was defined as a physician–patient encounter starting from

Table 1 Study clinic and participant characteristics

Characteristic	Study 1	Study 2
Primary care clinics	14	3
Clinic location	8 urban, 6 rural	2 urban, 1 rural
Observation dates	March 2008–July 2008	September 2008–March 2009
No. observations of adult, non-pregnant patients	50	93
No. clinics with electronic health records	9	2
No. participating physicians	14	16

the time that the physician physically began the clinic visit with the patient and ending when the physician physically ended their time with the patient. Additionally, tasks were included that the physician performed outside of the physical presence of the patient during the time of the visit (ie, the physician leaves the patient room to complete a task pertaining to the patient visit) and any time spent physically with the patient outside of the exam room (eg, walking the patient to the laboratory). Only observations of adult patients (aged 18 and older) were included in these analyses.

Development of the task analysis list

The unified observational data sample consisted of 30 PCPs across 17 internal medicine and family medicine clinics in Wisconsin and Iowa across rural and urban settings and community and academic settings. In order to systematically analyse the observation data to understand physician workflow, a secondary task analysis[24] was performed on the observation data. This is referred to as a secondary task analysis because the task analysis was performed on the observation data and not on the work itself. That is, the observation notes were as extensive as possible about what the physician did and the context; we did not simply try to enumerate the discrete tasks performed by the physician. This is a particular strength of the study. Conducting a real-time task analysis during observations would have required that we know what constituted a task a priori. Instead, we recorded everything that occurred during the visit and then analysed the data to determine what the tasks were.

The analysis and construction of the task list involved three steps. First, a preliminary list was developed from the data of the 50 patient–physician visits in study 1. This original list included tasks such as preparing for visits and dictating visits at the end of the day. Tasks in this analysis were organised by topic (eg, test results) and detailed related subtasks were recorded beneath the topic (eg, locate test results on EHR, review test result values, show test results to patient). The resulting task list consisted of 32 major physician tasks and 683 detailed subtasks that were identified as occurring at least once across all of the observations. Second, a literature review was completed, in which peer-reviewed articles were searched and medical texts on taking a medical history and performing a physical exam in primary care were reviewed.[25 26] The literature review was ongoing during the development of the preliminary task list. Few peer-reviewed articles were found that systematically identified tasks performed by PCPs. Most only discussed tasks at the major code level,[27 28] or detailed the typical performance of a very specific task in flowchart format.[29] Lastly, the investigators read the observation transcripts from both studies and through an iterative process of expert review, incorporation of literature review findings, addition of new tasks, data integration and pilot data analysis, the task list from study 1 was refined. The final task list had major tasks characterised by a verb, for example, 'review' or 'gather' and subtasks composed of subjects that clarified the major task, for example, medications. Identifying the major tasks by 'action' verbs allowed us to focus more on the interpreted cognitive processes of the physician from reviewing, to explaining, to recommending, while still giving detail to the specific subject topic (eg, test results) to which each action was applied.

The task list was input into Microsoft Excel 2007 and the major tasks (first level-codes) were put into a sequence of occurrence during a clinic visit and assigned a number from 1 to 12. Subject topics under each major task (second-level codes) were subsequently assigned the same number as the major task plus a letter, for example, '2D. Medication', thus implying that medication information is gathered by the physician from the patient. Additional subcodes (third-level codes) were incorporated into the subject topics by adding a number in parenthesis to further define the task being completed at the lowest level possible from the observations, for example, '2D(1). Side effects, risks and benefits'. A task list dictionary was created that outlined the task definitions for consistency of coding (see online appendix S1). To verify the task list and ensure completeness and representation of the data, pilot coding was performed on 12 observations (six from each study) by two independent coders. Each observation was coded using Microsoft Word 2007. Individual tasks were marked using the insert comment function to highlight text and note the task code at the lowest level. These comments were then entered in order into a spreadsheet using Microsoft Excel 2007. The output of the analysis was a listing of the tasks performed and a number sequence in which they were performed. If a task seemed to be performed simultaneously, the tasks were noted and given the same number in the sequence on the task list. The coding results were reviewed and discussed by the research team (all authors). Through an iterative process, new tasks were added, task definitions were clarified, tasks were combined or deleted, and the names of codes changed to ensure face validity. Consensus on the final task list was reached. Acceptable inter-rater reliability scores were achieved using final task list coding of three observations, 74% at the lowest level of task coding and 87% at the first level of coding.[30]

RESULTS

The final task list has 12 major tasks defined by action verbs and 189 subtasks providing the object of the action for a grand total of 191 possible tasks. Box 1 outlines the

Box 1 Abbreviated primary care physician task list during a patient encounter*

1. Enter room
2. Gather information from patient
   - 2A. Chief complaint
   - 2B. Problem information
   - 2C. Patient's current medications
   - 2D. Medications
   - 2E. Patient pharmacy
   - 2F. Cost/access/insurance
   - 2G. Allergies and adverse reactions
   - 2H. Drug/alcohol use
   - 2I. Tobacco use
   - 2J. Exercise/diet
   - 2K. Vitals/weight
   - 2L. Daily life activities
   - 2M. Support network, living situation, or help in emergency situation
   - 2N. Advanced medical directive/end of life
   - 2O. Family history
   - 2P. Patient home monitoring information
   - 2Q. Preventative screening
   - 2R. Test results
   - 2S. Physical exam
   - 2T. Diagnosis
   - 2U. Secondary patient
   - 2V. Previous appointments with same doctor
   - 2W. Review of symptoms/systems (not associated with main problems)
   - 2X. Social contact
   - 2Y. 'Anything else' question
   - 2Z. Other
3. Review patient information
   - 3A. Chief complaint
   - 3B. Problem information
   - 3C. Patient's current medications
   - 3D. Medications
   - 3E. Patient pharmacy
   - 3F. Cost/access/insurance
   - 3G. Allergies and adverse reactions
   - 3H. Drug/alcohol use
   - 3I. Tobacco use
   - 3J. Exercise/diet
   - 3K. Vitals/weight
   - 3L. Daily life activities
   - 3M. Support network, living situation, or help in emergency situation
   - 3N. Advanced medical directive/end of life
   - 3O. Family history
   - 3P. Patient home monitoring information
   - 3Q. Preventative screening
   - 3R. Test results
   - 3S. Physical exam
   - 3T. Diagnosis
   - 3U. Secondary patient
   - 3V. Previous appointments with same doctor
   - 3W. Nursing notes/clinic note
   - 3X. Past medical/surgical history/problem list
   - 3Y. Outside medical/counseling care
   - 3Z. Follow-up appointment information
   - 3AA. Patient paper forms
   - 3BB. Other

Continued

Box 1 Continued

4. Document patient information
   - 4A. Chief complaint
   - 4B. Problem information
   - 4C. Patient's current medications
   - 4D. Medications
   - 4E. Patient pharmacy
   - 4F. Cost/access/insurance
   - 4G. Allergies and adverse reactions
   - 4H. Drug/alcohol use
   - 4I. Tobacco use
   - 4J. Exercise/diet
   - 4K. Vitals/weight
   - 4L. Daily life activities
   - 4M. Support network, living situation, or help in emergency situation
   - 4N. Advanced medical directive/end of life
   - 4O. Family history
   - 4P. Patient home monitoring information
   - 4Q. Preventative screening
   - 4R. Test results
   - 4S. Physical exam
   - 4T. Diagnosis
   - 4U. Secondary patient
   - 4V. Treatment plan
   - 4W. Review of symptoms/systems (not associated with main problems)
   - 4X. Past medical/surgical history/problem list
   - 4Y. Outside medical/counseling care
   - 4Z. Follow-up appointment information
   - 4AA. Other
5. Perform
   - 5A. Procedure
   - 5B. Vitals
   - 5C. Physical exam
   - 5D. Hand sanitisation
   - 5E. Immunisation
   - 5F. Fill out patient form
   - 5G. Dictate
   - 5H. Telephone call/answer phone/pager
   - 5I. Calculation
   - 5J. Login to computer/EHR
   - 5K. Open template
   - 5L. Other
6. Recommend/discuss treatment options
   - 6A. Medication
   - 6B. Diet/exercise
   - 6C. Test/preventive screening
   - 6D. Procedure
   - 6E. Follow-up appointment
   - 6F. Referral to specialist
   - 6G. Home remedy
   - 6H. Non-traditional treatment
   - 6I. Observation/wait and see/do nothing
   - 6J. Immunisation
   - 6K. Home monitoring
   - 6L. Get additional information
   - 6M. Other

Continued

Box 1 Continued

7. Look up
   - 7A. Treatment information
   - 7B. Referral doctor
   - 7C. Drug information
   - 7D. Other
8. Order
   - 8A. Medication
   - 8B. Test
   - 8C. Referral to specialist
   - 8D. Procedure
   - 8E. Immunisation
   - 8F. Other
9. Communicate
   - 9A. Nurse
   - 9B. Other healthcare provider
10. Print/give patient (advice, instructions)
   - 10A. Paper prescription
   - 10B. Medication information/instructions
   - 10C. Test order form
   - 10D. Sample medication
   - 10E. Disease/problem information
   - 10F. Home monitoring card/paper
   - 10G. Medical equipment
   - 10H. Follow-up appointment information
   - 10I. Appointment summary
   - 10J. Referral information
   - 10K. Other
11. Appointment wrap-up
   - 11A. Walk patient
   - 11B. Go to (appointment not over)
   - 11C. Log out of computer/EHR
12. Leave room

*Notes: First-level and second-level tasks listed. For a complete task list, see online appendix S2. The order of tasks in the list does not imply any specific temporal order of execution. Add −C to a code to indicate that a care giver was involved with the task instead of the patient. Add −S to a code to indicate that a student who is working with the doctor performed the task instead of/for the doctor. For the codes '3. Review', '4. Document', and '8. Order,' add the following subcodes to indicate the location or source used: (a) electronic health record (EHR), (b) paper chart (or paper for the '8. Order' code), (c) scratch paper.

first-level and second-level tasks on the list. The complete task list is available online (see online appendix S2). Ten of the twelve major tasks identified were performed by the physicians with the patient during the clinic visit. The other two tasks were included to note when a physician left the patient room during the visit and what tasks were completed during that time. The task list was ordered in a linear sequence representing the order in which tasks might be reasonably executed during a hypothetical patient visit.

The major tasks, 'Gather', 'Review', and 'Document', have almost identical lists of subtasks. To start, all of the subtasks for these major tasks were identical; however, there were challenges with distinguishing some of the subtasks for the 'Gather' task. For example, it was difficult to distinguish the gathering of information from physicians and/or clinics outside of the health system of the PCP as opposed to information from within the physician's practice group or larger health system and the relevance of distinguishing this was uncertain. Therefore all information related to this subject was generally coded under the subtask 'problem information' when 'gathering information'. We included in-depth information about medication information flow because of the common nature of medication use in primary care and its strong relationship to quality and safety. Therefore the medication subtask under 'Gather' and 'Document' is more descriptive than other areas of the task list.

To better understand the use of the EHR and paper information sources during a physician−patient visit, additional task coding was included (either as a third-level or a fourth-level code using a lowercase letter) to identify the data source for the task, for example, the EHR, paper chart or a patient source (eg, patient or care giver memory, or paper source maintained by them). The use of source codes adds an additional 198 codes to the task list. We also found it valuable to note the presence of someone else in the room besides the physician and the patient who was involved in the care delivery, for example, a patient care giver (-C) or a medical student (-S). This was noted during coding by adding (-C) at the end of a code for patient care giver and (-S) for a medical student (-S). The use of such modifiers can assist evaluation of information flow.

DISCUSSION

The comprehensive PCP task list presented here was developed so that it could be adapted with minimal effort to other healthcare settings to assist in evaluating clinic workflows relative to patient visits. Specifically, this list provides information about the types of tasks being performed, the sequence in which the tasks *might be* performed, the data sources used by the physician for a given task, and the contribution of other persons (eg, medical students or caregivers) to the physician−patient visit. Neither the content nor the sequence is meant to be prescriptive or all-inclusive and will likely vary from country to country or even from clinician to clinician. The list is simply a generic formulation of the common tasks performed during a patient visit with the sequence being the most common found in the data sets used for development. In fact, we observed many different sequences, and recognise that many more are possible. We encourage individual practices/organizations to update or modify this list to suit their own circumstances.

This task list is intended to be a flexible tool to assist individuals or groups in analysing physician workflow before and after changes to the structure and processes of healthcare delivery, for example, implementation of health IT like EHRs, a clinic transition to be a PCMH, or other changes implemented during a quality improvement process, to help ensure that the design and implementation of the changes are optimal. The multiple levels of codes allow flexibility to code at a high level of major tasks or more in-depth second-level, third-level or fourth-level coding based on the need to study primary care workflow and the resources available to perform observations and code and analyse data.

Another example of practical application of the task list is that it can be used alone or in conjunction with other workflow analysis tools to gain a deeper understanding of a PCP's workflow, to see where problems lie and where improvements can be made. Using this list as a workflow study tool, a clinic could determine the flow of their visits and the types of tasks that routinely or irregularly occur. Hence, the clinic could construct specific and valid workflow scenarios of their actual work, which could then be used to determine which, if any, health IT vendor and implementation plan can accommodate their individual needs. Additionally, the data collected with this tool could be used to assist a vendor in tailoring the health IT software to individual needs. At the very least, it would allow clinics to better understand the changes that would occur if health IT that did not meet their specific circumstances was being implemented. That would afford an opportunity for principled decisions about what kinds of workflow changes to make. Importantly, using the tool after implementation would then provide an opportunity to further study the new workflow and work to optimise it.

Workflow analyses using task lists have been performed in a variety of other healthcare settings, such as hospital medical/surgical and intensive care units, and delivering anaesthesia in the operating room.[19–22] Zheng *et al* developed a task list and performed a time motion study to analyse physician workflow and use of health IT in paediatric intensive care units.[21] Battisto *et al* used a task list to describe nursing work in the hospital setting to inform the redesign of inpatient rooms and care areas to improve nursing productivity.[19] Our task list, similarly, should be useful in similar ways.

There are several limitations to the use of this task list to analyse PCP workflow. First, the density of coding does not represent the relative time spent on tasks during the visit, for example, it may take 5 min for a physician to recommend a test to a patient which is represented by a single code, however, a 5 min discussion about a patient's current medications may be represented by nine different codes that may be repeated during that time for each medication. Furthermore, simply comparing the number of codes across observations does not imply more or less work being done by a physician; only the type of work. However, the task list could be used concurrently with a system that allows time spent to be captured. This procedure could then be used to better understand time demands.[19] Last this task list, although developed and validated from a large, diverse pool of physician–patient visits, may not be a complete listing of all physician tasks. But we believe it represents the majority of tasks. The tasks performed by PCPs during patient visits will vary based on the context of the work system, that is, the country, the organisational characteristics, the tools and technologies in place, the clinical environment, the patient population and individual patient characteristics, and physician characteristics.[23] Clinics and individuals using this task list should be aware that additions to the list may be necessary based on the work context and the questions to be answered from the data collection.

CONCLUSIONS

This is a time of continuous, rapid, and mounting change for primary care globally. Given the state of rising demand on healthcare worldwide, future healthcare systems will need to be more efficient in their methods and practices, utilising every tool at their disposal. Hence, quality improvement strategies, health IT and major structural changes like the PCMH are at the forefront. Their roles have been defined both as a tool and a catalyst for this change. However, every change that occurs has consequences for clinical workflow. If resulting workflows are unanticipated, cumbersome, and/or inefficient, physician workload increases and patient care can suffer. It is critical that primary care clinics have support tools they can use to proactively study their workflows so that they can meaningfully plan for these changes. The task list presented offers a first step in providing such tools, the potential benefit of which includes reducing the cost of future similar workflow assessments, reducing the time to completion of workflow assessments, and improved ability to understand and evaluate the overall efficiency of a clinic workflow.

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