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Allocation of Physician Time in Ambulatory Practice: A Time and Motion Study in 4 Specialties

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Background: Little is known about how physician time is allocated in ambulatory care.

Objective: To describe how physician time is spent in ambulatory practice.

Design: Quantitative direct observational time and motion study (during office hours) and self-reported diary (after hours).

Setting: U.S. ambulatory care in 4 specialties in 4 states (Illinois, New Hampshire, Virginia, and Washington).

Participants: 57 U.S. physicians in family medicine, internal medicine, cardiology, and orthopedics who were observed for 430 hours, 21 of whom also completed after-hours diaries.

Measurements: Proportions of time spent on 4 activities (direct clinical face time, electronic health record [EHR] and desk work, administrative tasks, and other tasks) and self-reported after-hours work.

Results: During the office day, physicians spent 27.0% of their total time on direct clinical face time with patients and 49.2% of their time on EHR and desk work. While in the examination room with patients, physicians spent 52.9% of the time on direct clinical face time and 37.0% on EHR and desk work. The 21 physicians who completed after-hours diaries reported 1 to 2 hours of after-hours work each night, devoted mostly to EHR tasks.

Limitations: Data were gathered in self-selected, high-performing practices and may not be generalizable to other settings. The descriptive study design did not support formal statistical comparisons by physician and practice characteristics.

Conclusion: For every hour physicians provide direct clinical face time to patients, nearly 2 additional hours is spent on EHR and desk work within the clinic day. Outside office hours, physicians spend another 1 to 2 hours of personal time each night doing additional computer and other clerical work.

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Ambulatory care in the United States has been subject to dramatic pressures in the past decade to cut costs, meet regulations, and transition to electronic health records (EHRs). Effects on ambulatory care are still unknown, and unintended consequences are gradually gaining recognition, including additional time spent documenting care (1) and performance metrics (2), impaired communication with patients (3), and increased career dissatisfaction (4) and burnout (5–7) among physicians.

In the context of rapid change, dissatisfaction among physicians with how their time and skills are used is widespread and growing. Fifty-four percent of U.S. physicians experience some sign of burnout (5), an increase from 46% (6) over a 3-year period, 2011 to 2014, ($P < 0.001$). Time spent in meaningful interactions with patients and the ability to provide high-quality care are powerful drivers of physician career satisfaction (4). Conversely, physician dissatisfaction has centered on the changing content of their work, with more time spent on paperwork and the computer (7) and less time available for direct clinical face time with patients (4). Correlations between increases in EHR task load and physician burnout and attrition have also been shown (7, 8).

This study was undertaken because there are minimal quantitative data on how physicians' time is allocated in ambulatory care. Prior studies predate the widespread use of EHRs and the current regulatory environment (9–14). Our goal was to describe time allocation and practice characteristics (including EHR use and documentation support services) for physicians in the era of EHRs and federal incentive and penalty programs. In other words, what is work like for physicians in the ambulatory trenches?

Methods

Study Participants

The American Medical Association's (AMA) annual study of physician characteristics and distribution in the United States (compiled from the AMA Physician Masterfile) and discussions among the researchers informed the decision to study 2 types of primary care practices (family medicine and internal medicine), 1 medical specialty (cardiology), and 1 surgical specialty (orthopedics). These specialties and practice types had higher numbers of physicians than other specialties outlined in the report and were therefore selected to ensure a participant base that was representative of a large and inclusive number of physicians. Once the specialties were determined, 4 states (Illinois, New

See also:

Editorial comment 818

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Supplement

Table 1. Definitions of Physician Work Activities and Tasks

Task Category, by Activity During Office Hours	Description
Direct clinical face time	
With patient	Includes taking a history; performing a physical examination or procedures; and assessing, planning, and discussing facts with or about a patient (family members are included as patients); excludes computer work
With staff and others	Spoken communication with staff and others that relates to patient care (not in the presence of a patient)
EHR and desk work*	
Documentation and review	Work done on paper or electronically; includes but cannot differentiate between information seeking and recording details about the patient encounter
Test result	Activity related to accessing a test or image result on paper, in an EHR, in a picture archiving and communication system, or in another system; also includes asking staff
Medication order	Activity related to arranging medications for patients, including over-the-counter medications and vaccinations
Other order	Activity related to referrals and other nonmedication or test orders
Administrative tasks	
Insurance	Activity related to patient's health insurance, including but not limited to preauthorization, workers' compensation, claim submission, eligibility checks, and other revenue cycle functions
Scheduling	Logistical arrangements for a physician–patient encounter
Other tasks	
Closed to observation	Physician or patient asks observer not to observe
Other (aggregated)	Meetings (e.g., scheduled practice "huddles") Education (e.g., webinar) Business (e.g., practice audits and marketing strategy) Crashed or frozen technology (e.g., had to reboot the EHR) Other communication (face-to-face discussion that is not about patient care and is not personal) Other (activity that falls outside all definitions)
Transit	Physician travel between examination rooms or other office locations
Personal	Restroom breaks, eating, and personal telephone calls

EHR = electronic health record.
* Can be with anyone in any place and includes work with all electronic devices or paper.

Hampshire, Virginia, and Washington) were selected to fulfill the second criterion of a geographically diverse sample. No other factors were considered in the recruitment. Sixteen practices were formally recruited using stratified nonprobability sampling based on predetermined categories (specialty and geographic location). Four accepted but later withdrew. Recruitment continued until withdrawals were replaced and the target number of each specialty and geographic location was reached. Approval was obtained from the relevant institutional review boards. The final number of participants was based on availability during the days of scheduled observation.

Data Sources and Measurements

This study used 2 instruments for capture of work activity: direct observation by trained observers using a time and motion approach during office hours, and a self-reported diary for after-hours work. All direct observation data were collected from 7 July 2015 to 11 August 2015 on weekdays between 7:00 a.m. and 8:30 p.m. Any physician or patient could decline to be observed; this time was recorded as "closed to observation." No patient identifier or health information was recorded.

Direct observations were limited to clinical office days. Work at home (sampled through voluntary diaries) and hours removed from the clinical schedule (for example, "administrative" afternoons or research days) were excluded. Clinical work outside the ambulatory clinic was also excluded (for example, laboratory work or procedures performed outside the clinic). Most of the physicians had more than 35 scheduled patient contact hours per week.

We did not measure the number of patients seen per hour, their medical complexity, or the quality of the care provided. No time data were collected for support staff.

Observations were performed by medical students (observers) with extensive experience working or observing in ambulatory clinics. The Work Observation Method by Activity Timing (WOMBAT) was used (15). This is a technique for undertaking direct observational studies of health professionals that has been applied in a range of settings (16–24). The WOMBAT software allows researchers to customize the work classification used to capture multiple dimensions of work.

After extensive pilot observations, a physician work task classification was devised and incorporated into the WOMBAT tool (**Supplement**, available at www.annals.org). The final classification had 12 broad, mutually exclusive work task categories. These categories were later grouped into 4 activities for analyses: direct clinical face time between physician and patient or physician and staff, EHR and desk work, administrative tasks, and other tasks (**Table 1**). All 12 tasks could be conducted in parallel (multitasking); for example, a physician could review documents while in transit.

All observable actions were mutually exclusive and strictly defined. Observers coded what physicians were doing, where they were doing it, with whom they were engaged, and the information tools they used for the activity. Data were uploaded to a secure server each night.

Observers underwent intensive training in the WOMBAT technique and task classification using lecture formats, training videos, and practice sessions in live clinics. Observation sessions were limited to no

more than 2 hours to maintain optimal observer vigilance. Observers worked in pairs and rotated in and out of data collection sessions in a synchronized manner to minimize missed data.

Before fieldwork began, the 10 observers undertook interrater reliability testing based on an approximately 45-minute video of ambulatory care practice scenarios that were designed to cover 12 defined work tasks. Because there is no universally agreed-on method to assess interrater reliability for time and motion studies, one observer who demonstrated the best understanding of the task definitions was designated as the "standard." The scenario video observation time was split into 934 three-second intervals that were allocated into 10 broad task categories by each observer. The κ scores ranged from 0.83 to 0.96, and the average κ score for task category agreement was 0.91, indicating strong agreement between observers in classifying tasks (25). Table 2 summarizes the percentages of time spent on tasks recorded by the observers.

Self-Reported Diary of Work

All participating physicians were invited to self-report after-hours work activity for 7 consecutive days. Each physician was provided a diary for recording time spent on EHR activities and total time (Supplement). Collected data were reviewed for completeness. All task times were aggregated to identify the total time spent on work at home. Time spent using the EHR was complete and unambiguous. Our data analysis segmented total time and time using the EHR on off-duty evenings as well as when the physician was "on call."

Statistical Analysis

Descriptive statistics are presented to show how participating physicians distributed their time across different activities and tasks. The percentage of time spent by participating physicians on a specific activity or task was calculated by dividing the time spent on the activity or task by the total observation time; 95% CIs of these percentages were calculated based on the large sample normal approximation. We also calculated κ scores (26) to measure interobserver reliability. Data were analyzed using SAS, version 9.4 (SAS Institute).

Role of the Funding Source

This study was funded by the AMA, which employs 4 of the authors (C.S., S.R., L.G., and M.T.). Authors from the AMA collaborated with Dartmouth-Hitchcock on the design of the study and subsequent analysis of the reported results. Researchers from Dartmouth-Hitchcock conducted the study and provided reports on the results.

RESULTS

Participant Characteristics

In this study, 57 physicians from 16 practices in 4 states were observed (Table 3). A total of 23 416 tasks were recorded over 430 hours of observation. Among the 57 physicians, 79% (n = 45) were men and 82% (n = 47) were aged 31 to 60 years. Physicians were distributed across family medicine (n = 12 from 4 practices; 116 hours), internal medicine (n = 19 from 5 practices; 142 hours), cardiology (n = 11 from 3 practices; 63 hours), and orthopedics (n = 15 from 4 practices; 107 hours). The median number of hours of observation was 8 (range, 1 to 25 hours). Forty-six percent of participating physicians (n = 26) had documentation support services available (dictation for 21 and documentation assistant services for 5). One practice did not have an EHR system, and 7 EHR systems were used in the remaining 15 practices: Epic (7 practices), Allscripts (3 practices), athenahealth (1 practice), Centricity (1 practice), NextGen (1 practice), SRS (1 practice), and eClinicalWorks (1 practice) (Table 3). Excluding the paper-based practice, 91% of practices had met stage 2 of the Centers for Medicare & Medicaid Services "meaningful use" criteria and intended to participate in stage 3.

Work Activities During Office Hours

The observational data reflect both examination room and non–examination room time (for example, workstation or office). Physicians in our study spent 33.1% of this total time on direct clinical face time: 27.0% with patients in the examination room, and 6.1% with staff when the patient was not present (for example, speaking with a nurse in a workstation room) (Table 4).

Nearly half of physicians' total time (49.2%) was spent on EHR and desk work. Of this time, 38.5% was spent on documentation and review tasks, with the remainder spent on test results (6.3%), medication orders (2.4%), and other orders (2.0%). Physicians spent 1.1%

Table 2. Interrater Reliability for Reference Testing Video

Observer Identification	Time Spent, %									
	Direct Clinical Face Time	Documentation and Review	Medication Order	Test Result	Other Order	Insurance	Scheduling	Transit	Personal	Other
53	1.5	35.6	7.3	9.8	12.5	3.1	4.7	7.8	8.6	9.0
54	3.6	36.5	7.4	10.1	9.7	3.0	4.7	6.6	8.5	9.9
55	3.4	36.4	7.4	10.7	9.8	3.2	4.6	6.9	8.5	9.2
56	2.5	36.6	7.6	8.4	11.1	3.2	4.9	7.9	8.8	9.1
57	0.5	35.8	8.1	10.3	10.9	3.0	4.7	7.4	8.3	11.2
58	2.6	36.3	7.4	10.7	9.7	3.1	4.7	7.5	8.6	9.4
60	3.3	36.3	7.5	9.7	9.9	3.2	4.7	8.0	8.5	9.0
61	7.0	35.6	7.3	8.6	9.6	3.1	4.6	6.8	8.5	8.9
62	6.4	34.8	7.4	7.0	9.6	3.1	4.6	9.0	8.5	9.7

Table 3. Participant Characteristics

EHR System, by Specialty	Physicians (Access to Documentation Support), *n*	Hours Observed	Age Range, *n*	Male-to-Female Ratio	State
Family medicine					
eClinical Works	2 (none)	38	31–40 y: 2	0:2	Illinois
Epic	2 (none)	7	31–40 y: 2 41–50 y: 1	1:1	New Hampshire
Allscripts	4 (none)	36	41–50 y: 2 51–60 y: 1 ≥61 y: 1	4:0	Virginia
Centricity	4 (none)	35	41–50 y: 2 ≥61 y: 2	3:1	Washington
Internal medicine					
Epic	3 (none)	24	41–50 y: 1 51–60 y: 2	2:1	Illinois
Epic	2 (none)	29	41–50 y: 1 51–60 y: 1	2:0	Illinois
Epic	2 (none)	15	31–40 y: 1	2:0	New Hampshire
None	4 (none)	36	<31 y: 1 31–40 y: 1 51–60 y: 2	3:1	Virginia
Epic	8 (1 none; 7 dictation)	38	31–40 y: 2 41–50 y: 4 51–60 y: 1 ≥61 y: 1	5:3	Washington
Cardiology					
Allscripts	1 (dictation)	1	51–60 y: 1	1:0	Illinois
NextGen	6 (3 none; 2 dictation; 1 documentation assistant)	26	31–40 y: 1 41–50 y: 1 51–60 y: 1 ≥61 y: 3	6:0	Virginia
Epic	4 (1 none; 3 dictation)	36	31–40 y: 1 41–50 y: 1 51–60 y: 1 ≥61 y: 1	4:0	Washington
Orthopedics					
SRS	4 (dictation)	31	31–40 y: 1 41–50 y: 2 51–60 y: 1	4:0	Illinois
Epic	3 (2 none; 1 dictation)	32	31–40 y: 2 41–50 y: 1	1:2	New Hampshire
All scripts	3 (dictation)	10	41–50 y: 1 51–60 y: 2	3:0	Virginia
Athena health	5 (1 none; 4 documentation assistant)	34	31–40 y: 3 51–60 y: 1 ≥61 y: 1	4:1	Washington

EHR = electronic health record.

of their time on administrative tasks, of which 0.6% involved insurance-related tasks and 0.5% involved scheduling (Table 4).

Outside of these tasks, 19.9% of physicians' time was spent on other tasks, including personal breaks (6.3%), transit time within the clinic (2.9%), time that was closed to observation (5.5%), and other tasks (5.2%) (Table 4).

Physicians in our sample spent 47.7% of their time in the examination room with patients (205 hours). During this time, they spent 52.9% of their time on direct clinical face time with patients, 37.0% on EHR and desk work, 9.3% on administrative tasks, and 0.8% on other tasks.

Twenty-six of the 57 physicians used documentation support (dictation for 21 and a documentation assistant for 5). Of note, no primary care practices had documentation support. Hours observed included those with no documentation support (270 hours), those with dictation services (130 hours), and those with documentation assistant services (30 hours). Physicians in our sample with documentation support spent more time on direct clinical face time with patients (31.4% for those with dictation and 43.9% for those with a documentation assistant) than those without documentation support (23.1%).

After-Hours Work Activities

Twenty-one of the 57 physicians (36.8%) self-reported after-hours work activity. Thirty out of 124 nights (24.2%) documented by those physicians involved night and weekend coverage for the practice (on call). Physicians who completed after-hours diaries dedicated a mean of 1.5 hours to after-hours work per day, with 59% of the time spent using an EHR. When providing night coverage for the practice, physicians

allocated a mean of 2.2 hours per day to performing work tasks and used the EHR for 69% of this time.

DISCUSSION

Our study quantifies the allocation of physician resources during office hours via direct observation and after office hours via diaries. During office hours, physicians in our sample spent nearly half their time on EHR and desk work activities and less than one third on direct clinical face time with patients; in other words, for every hour of direct clinical face time with patients, physicians spent almost 2 hours on EHR and desk work. In addition, for physicians who completed after-hours diaries, EHR and desk work regularly extended 1 to 2 hours beyond office hours into personal time.

Use of EHRs has brought the promise of many advances in patient care, although recent analyses have shown a gap between expectations and outcomes (27–29). Increasing demands associated with EHRs and meaningful use requirements can produce unintended negative consequences (1, 2). For example, one might hypothesize that new EHR activities decrease the time physicians spend engaging with patients. Our data quantify previous survey data showing that physicians report spending substantial work time using the EHR (6, 30). These previous studies have suggested that decreased time with patients and increased workload from EHR tasks are major contributors to career dissatisfaction among physicians. Furthermore, changes in physician work activity patterns are associated with high physician burnout rates that increased rapidly between 2011 and 2014 (5).

Direct observation allowed us to describe time distribution objectively, avoiding potential participant bias found in self-reports or surveys. Audits of EHR keystrokes and screens viewed provide objective data on EHR users (31), but direct observation captures work and interactions both with and without electronic devices. Our methods allowed us to provide a broader view of the role and significance of the EHR in the ambulatory environment.

Our finding that physicians interact with an EHR during 37.0% of the time they spend with patients is consistent with other studies, using different methods, that showed that one third of patient time is spent using an EHR (32, 33). The burden of EHR and desk work and administrative tasks (10, 12, 31, 34–36) and increases in documentation time after EHR introduction have been described (1).

Our results suggest that documentation support with either dictation or assistant services may increase direct clinical face time with patients. This is consistent with studies demonstrating benefits from sharing documentation and order entry tasks with team members, including saving physician time (37), boosting productivity (38), increasing capacity and thus access for patients (39), improving quality of documentation (40), and improving patient and provider satisfaction (35, 41). Optimization of documentation support may be achieved through models of advanced teamwork (42–46) or documentation assistants (37, 38, 40, 41, 47).

This quantitative activity analysis of physician work is only the first step in characterizing the ambulatory care work domain with regard to what is done, where, and for how long. The activity observed should not be assumed to be good or bad. Rather, it needs to be linked to quality, financial, and professional satisfaction outcomes for a full understanding of the activities that are critical to achieving superior clinical outcomes versus the activities that are required only for administrative and regulatory purposes or that represent a source of inefficiency or a waste of time, talent, or resources.

Table 4. Physician Time Distribution During Office Hours, by Task Category

Task Category, by Activity During Office Hours	Tasks, *n*	Mean Time to Complete Task, *s*	Tasks per Hour, *n*	Time Spent (95% CI), %	
				Total*	By Task Category
Direct clinical face time				33.1 (31.9–34.5)	
With patient	4483	93	10	–	27.0 (25.8–28.3)
With staff and others (patient not present)	2121	45	5	–	6.1 (5.7–6.5)
EHR and desk work				49.2 (47.8–50.6)	
Documentation and review	8623	69	20	–	38.5 (37.3–39.8)
Test result	1661	59	4	–	6.3 (5.8–6.8)
Medication order	622	59	1	–	2.4 (2.2–2.5)
Other order	610	52	1	–	2.0 (1.9–2.2)
Administrative tasks				1.1 (0.9–1.3)	
Insurance	191	49	<1	–	0.6 (0.5–0.7)
Scheduling	125	59	<1	–	0.5 (0.3–0.6)
Other tasks				19.9 (18.2–21.6)	
Closed to observation	163	524	<1	–	5.5 (4.5–6.5)
Other (aggregated)	969	183	2	–	5.2 (4.3–6.0)
Transit	2946	15	7	–	2.9 (2.8–3.0)
Personal	902	109	2	–	6.3 (5.6–7.1)

EHR = electronic health record.
* Total sums to 103.3% because the Work Observation Method by Activity Timing platform allows recording of 2 tasks done in parallel. Multitasking results in overlapping time records, which are additive. Thus, the total task time is >100% of the total time observed.

This study has several limitations. The sample was too small to permit comparisons across specialties. The practices were self-selected and, except for 1 with 2 physicians, considered themselves high-functioning offices and teams with adequate support for EHR users. Of note, 2 practices agreed to participate but withdrew after staff resignations, stating that they "couldn't cope" with anything extra. This suggests that practices under workforce stress or experiencing other disruptors would screen themselves out. Documentation support was highly correlated with specialty in our study. Our sample size and study design did not permit analysis that would control for this potential confounder. Further study on the effect of documentation support on direct clinical face time with patients is warranted. The specific task the physician was performing on the EHR (such as visit note documentation, prescription refill, order entry, or insurance-related administration) could not be collected with unobtrusive observation.

Conclusions about the link between age and time spent on EHR and desk work are strongly cautioned against because sampling was not controlled for age. Furthermore, data on cognitive workload after implementation of the meaningful use EHR initiative showed that age was not a predictor of higher long-term workload (46).

Physicians may have changed their behavior as a result of being observed (the Hawthorne effect). Clinical staff work was not timed, so administrative and regulatory tasks (such as prior authorizations, referrals, and performance measurements [1] delegated to nonphysician staff) were not addressed in our study.

This study was not designed to assess comparative effectiveness of differing documentation methods, so conclusions should not be drawn. The number of observation hours for documentation assistant services was small. Similarly, the effect of documentation assistant services compared with dictation would need to be confirmed with a larger sample and additional controls. Such a study may be worth pursuing, and we have provided the results for interested parties. The diary of after-hours work was subject to self-selection and the inability to directly correlate after-hours work with particulars of each office day and patient load. Furthermore, that fewer than 50% of physicians participated may have introduced additional bias.

Our methods enabled us to objectively measure time spent on EHR and desk work, not the true cost of this work in terms of cognitive load or restrictions to adapting workflow to patient needs. For example, poor usability of the EHR as a work tool (48–51) represents an invisible burden on users. Alternatively, a well-constructed EHR might decrease cognitive workload. Therefore, the full cost of EHR and desk work in terms of cognitive load and workflow deserves further study.

The effect of future interventions targeting physician time distribution can be tested with robust, standardized approaches, such as the WOMBAT tool and platform. Once definitions are developed, preintervention and postintervention observations can be efficiently collected and analyzed. The combination of direct observation with other methods can provide powerful triangulated views into these complex issues (51).

The diary component of this study, which indicated an additional 1 to 2 hours of after-hours work per day, is consistent with previous surveys showing increases in physician after-hours work after EHR implementation (51). Family physicians (52) and internists (30) reported losing almost an hour of personal time to the EHR each day. Audits of EHR data indicated that family physicians spend more than an hour of personal time on computer tasks each day (31). After-hours work demands may present a threat to physician satisfaction, recruitment, and retention.

In conclusion, our study sheds light on physician time distribution between EHR and desk work and direct clinical face time. For every office hour spent on direct clinical face time with patients, physicians in our sample spent nearly an additional 2 hours on EHR and desk work. Physicians spend nearly half of the total office day on EHR and desk work and less than one third on direct clinical face time with patients. They also spend 1 to 2 hours of personal time at home each night to "keep up." We recommend further study to identify links between variations in use of physician resources and clinical, financial, and professional satisfaction outcomes.

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