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Assessing Unwanted Variations in Rheumatology Clinic Pre-Visit Rooming

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Abstract

Background—Rheumatologists face time pressures similar to primary care but have not generally benefitted from optimized team-based rooming during the time from the waiting room until the rheumatologist enters the room.

Objective—To assess current capacity for population management in rheumatology clinics, we aimed to measure the tasks performed by rheumatology clinic staff (medical assistants or nurses) during rooming.

Methods—We performed a cross-sectional time study and work system analysis to measure rooming workflows at three rheumatology clinics in an academic multispecialty practice during 2014-2015. We calculated descriptive statistics and compared frequencies and durations using Fischer's exact test and analysis of variance.

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Results—Observing 190 rheumatology clinic pre-visit rooming sequences (1,419 minutes), we found many significant variations. Total rooming duration varied by clinic (median 6.75 to 8.25 min, $p<0.001$). Vital sign measurement and medication reconciliation accounted for over half of rooming duration. Among three clinics, two of 15 tasks varied significantly in duration, and nine varied in frequency. Findings led clinic leaders to modify policies and procedures regarding six high-variation tasks streamlining: assessment of weight, height, pain scores, tobacco use, disease activity, and refill needs.

Conclusions—Assessing rheumatology rooming tasks identified key opportunities to improve quality and efficiency without burdening providers. This project demonstrated user-friendly methods to identify opportunities to standardize rooming and support data-driven decisions regarding rheumatology clinic practice changes to improve population management in rheumatology.

Indexing Terms

Health Services Research; Measurement Instrument; Quality of Care; Systems-based Study; Clinical Practice Variation; Medical Staff

INTRODUCTION

Caring for patients with chronic rheumatologic conditions increasingly calls for population management activities such as disease activity measurement, medication management, and preventive care delivery. Unique population-specific needs are outlined by the American College of Rheumatology and other specialty society guidelines [1-3]. For example, disease- or medication-specific assessments, such as disease activity questionnaires for rheumatoid arthritis, other disease-specific risk screenings [4, 5], or novel immunizations [1-3], might be more effectively delivered by rheumatology clinics compared to primary clinics. Planned pre-visit rooming activities performed by clinic staff can address those needs without burdening busy clinicians. In primary care, purposefully redesigning team-based pre-visit rooming activities has improved population management and quality of care, and it has saved clinicians time [6, 7].

The rooming process consists of the sequence of tasks performed from the time patients are invited from the waiting room until they are ready for the provider's visit. These tasks are typically performed by medical assistants (MA) or nurses (RN) in the United States. In primary care, optimized rooming facilitates clinic efficiency [8] and also improves physician satisfaction [6]. In primary care, pre-visit initiatives include chronic and preventive care, such as protocols enabling staff to order overdue diabetes testing or administer flu shots. Some clinics have even trained their MAs as health coaches to counsel patients on chronic disease and preventive care during the rooming process [7, 9, 10]. The American Medical Association (AMA) estimates savings of \$66,000 annually per physician with an optimized team-based rooming process [11]. Moreover, a recent white paper by the American Board of Internal Medicine hailed team-based redesign of rooming as a key way to enhance physician satisfaction, and this applies in both primary care and specialty clinics [12]. However, optimized team-based rooming processes have not yet been leveraged in rheumatology clinics despite similar time pressures and unique population management needs.

In order to optimize team-based rooming in rheumatology clinics without burdening providers, one must first assess what workflows happen during the rooming process to inform meaningful workflow redesign. In its best-practice module on rooming processes, the AMA recommends the following steps: (1) identify current workflows, (2) create a rooming checklist, and (3) refine the checklist [11]. Several primary care studies have analyzed physician workflow [13-15] and the effects of electronic health records (EHRs) [16, 17] and team-based approaches [8] on workflows. However, no such investigation has assessed and reported on rooming workflows in rheumatology clinics, which was our aim.

In order to identify current workflows and create a rooming checklist as recommended by the AMA, we selected a systems engineering technique, called time study [18], to measure current rooming workflows, focusing on tasks, frequencies, and durations. Advantages of time study include measuring the actual time taken by a worker to complete tasks, observation of cycles where some tasks do or do not occur, ease of use, and accuracy [19]. A structured observation tool makes it possible for time studies to be easily executed by staff in rheumatology clinics. Such tools can be used to measure baseline and improved rooming processes, including pre-visit disease assessment and preventive care in rheumatology clinics.

Our long-term goal is to build capacity for population management including rheumatology staff protocol interventions for hypertension and tobacco cessation referral. Our objectives here were to assess current capacity by developing a taxonomy listing rheumatology rooming tasks, creating an easy-to-use time study measurement observation tool, and assessing the baseline frequencies and durations of rooming tasks to build efficiencies and measure future improvement program changes.

METHODS

Design

Using a cross-sectional time study design, we measured rooming task frequency and duration of 22 *a priori* defined tasks. We measured the observed tasks performed by MAs/RNs during the rooming process in a convenience sample of rheumatology visits. We used continuous timing to obtain complete records of the entire observation and individual tasks, and to record delays and additional tasks that were not known to us prior to the time study.

Six trained engineering and medical student observers shadowed MAs/RNs to record the tasks performed between ushering the patient from the waiting room and the rheumatologist's entry to the examination room. The observers used a structured time study tool to record data and were trained by the lead observer (ER) who also performed work system observations and analysis.

The project received an exemption from the University of Wisconsin-Madison Institutional Review Board as preparatory evaluation for a quality improvement project, with expressed permission to publish. Patients were each informed of the purpose of the project and rarely refused observation. This report is consistent with the STROBE reporting guidelines [19].

Setting

We conducted this project in three adult rheumatology clinics with separate staff teams within a large academic multispecialty group in a US midwestern city between September 2014 and June 2015. Clinic A was a low-volume academic multispecialty clinic with comparable rheumatology patient population to Clinic C, a high-volume academic rheumatology clinic. Clinic B was a high-volume community rheumatology clinic serving a patient population with fewer women (67.6% vs. 75% and 76.5%), lower comorbidity scores [20] ($p < 0.05$), and fewer complex diagnoses (lupus $p < 0.001$, vasculitis $p < 0.001$). All three clinic populations had comparable mean age (53.87, 55.8, 55.8) and percent of patients with rheumatoid arthritis (27.67, 29.62, 29.51).

Measurement

In order to facilitate data collection, we designed a paper-based clinic observation tool. The multi-disciplinary team defined the *a priori* tasks using standard policy and procedure documents of the institution, preliminary observations, and interviews with rooming staff.

The time-study tool we developed (Figure 1) included sections for observation details including date, time, clinic, person observing, and staff observed. Next, 22 columns listed *a priori* defined tasks and additional blank columns for tasks discovered during observation. We designed the time study tool to fit on one letter-sized page, and the choice of a 30 second row as a time unit was based on preliminary observations that total rooming times were between 5 and 20 minutes, wherein most tasks were at least 15 to 30 seconds. Additional details were collected by using three different symbols (“/”, “\”, and “X”) to record the first or second 15 seconds of a 30-second period or task, respectively. Although some tasks did not take longer than a few seconds (e.g., obtaining patient’s tobacco history), we reasoned that determining the precise duration (e.g., 4 seconds versus 15 seconds) for a minority of tasks was less important than recording their occurrence. In addition to the letter-sized paper time study tool, equipment included a stopwatch and clipboard.

Analysis

We analyzed the time-study observation data in two steps. First, we categorized the tasks based upon sequence and clinical objectives into a taxonomy. The categorization was guided by multidisciplinary review by nursing, medical (rheumatology, cardiology, and primary care), and systems engineering team members. Second, we calculated the frequencies of tasks and descriptive statistics for the durations of tasks, accounting for measurement precision and task overlap when aggregating durations. We compared task frequencies among clinics using Fisher’s exact test. Then we compared task durations among clinics using analysis of variance (ANOVA). A p-value of 0.05 or below was considered significant. We calculated medians and interquartile ranges and used box and whisker plots to report the distribution and outliers for the total duration of rooming sequences overall and by clinic. Two reviewers performed 5% of total data re-entry with a 98.2% inter-rater agreement.

Complementary to analyzing the time measurements, the lead observer, a trained systems engineer (ER), observed and analyzed work-system differences among the clinics in a convenience subsample (68 observations, 551 minutes) using the Systems Engineering

Initiative for Patient Safety (SEIPS) model of work systems [20-22]. The SEIPS work system analysis examined interactions between people, tasks, organization, technology, and physical environment. These findings aimed to complement the time study with contextual insights for interpreting results and planning future improvements.

RESULTS

Observers conducted a total of 1,419 minutes of observations in 190 rooming sequences across the three clinics. They observed 15 additional tasks beyond those outlined *a priori* during development (see supplementary file). The team reviewed the resulting list and created a taxonomy divided into five categories based on the sequence and clinical objectives of each task (Table 1). For example, all tasks relevant to the patient's disease or long-term preventive health were grouped in a "chronic disease management" category including smoking, health assessment questionnaires (including new patient forms and arthritis monitoring forms) [23], pain assessments, and vaccinations.

Variations in Total Duration

Total rooming duration varied from <1 to 22 minutes among observed rooming sequences. The median rooming duration was 6.75 minutes and varied significantly among clinics ($p < 0.001$) (Figure 2). New patient encounters lasted an average of 1.75 minutes longer than those for returning patients ($p = 0.004$). Seventy percent of rooming sequences were performed by MAs, and durations did not differ by staff type (MA vs. RN; data not shown).

Variations in Duration of Particular Tasks

Variations in individual task durations were examined next (Table 2). Vital signs and medication reconciliation accounted for over half of the total rooming duration. Maximum variability in duration occurred with medication reconciliation, questionnaire administration, and other conversations. Two task category durations varied significantly among clinics: vital signs measurement and other questions or conversations.

Variations in Task Frequency

Additionally, the frequency of individual tasks was studied (Table 3 presents the percentage of visits in which each task occurred (e.g., pain assessment occurred in 61% of visits), and the percentage of visits in which any task in a category occurred (e.g., any chronic disease management including pain assessment, disease activity, vaccinations, or tobacco history occurred in 75% of visits). Only four tasks were observed in more than 90% of visits: rooming initiation, pulse, blood pressure measurement, and medication reconciliation. Multidisciplinary review of nine tasks with high frequency variation were selected as candidates for standardization: height measurement, weight measurement, cuing prescription refills, pain assessment, questionnaire administration (disease activity, new patient), and tobacco history.

Other Observed Rooming Components

Conversations outside *a priori* defined tasks occurred in 84% of observed visits. These conversations included 1) asking reason for visit or concerns, 2) learning styles or visual

impairment assessments, 3) outside record or phone authorizations, 4) lab or insurance questions, or 5) general conversations (e.g., recent travel), and 6) wrap-up (see supplementary file). We used the “Other Clinical Questions or Conversations” category to summarize these observed tasks that did not simultaneously fit in any other categories. Thus the average duration of the “Other” category does not refer to the total duration of clinical questions and discussion, but only the time spent during which no other task occurred. We found that 17% of average rooming duration (1.3 of 7.5 minutes) was spent only on “Other Clinical Questions or Conversations” that did not fit any specific a priori task definitions. Such conversations were considered beyond the scope of task standardization.

Work System Differences

Work system observations identified differences among the clinics related to the five SEIPS domains of person, tasks, organization, technology, and physical environment [20-22]. Clinic A was a low-volume academic multispecialty clinic where one MA and three nurses roomed patients for two part-time rheumatologists. Clinic B was an academic-community clinic where two MAs and two nurses room patients for four full-time rheumatologists. In Clinic C, two MAs roomed all patients for six academic rheumatologists (five part-time, one full-time) and one nurse practitioner. Each clinic had their own regular staff and occasional support from float staff when regular staff were absent. Each clinic had their own separate regular staff and occasional support from float staff when regular staff were absent. The clinic volume of rheumatology visits was assessed between October 17, 2014 and December 31, 2014. Clinic A had 141 visits, Clinic B had 1172 visits, and Clinic C had 1173. During that period, the patient to staff ratio was therefore twice as high in Clinic B as in Clinic C.

In addition to staffing and visit volume, clinic differences included organizational structures and policies, physical layout, and EHR configuration. For example, in Clinics B and C, rooming was performed by MAs or RNs interchangeably, whereas it was performed exclusively by MAs in Clinic A. Differences in rooming task duration and frequency between RNs and MAs were not significant. Additionally, the physical layout in Clinic A had the MAs sitting at a reception desk inside the clinic area, separate from nurses. In Clinic B, MAs and nurses all shared a room inside the clinic area, with schedulers sharing that room at a reception desk with a window facing the waiting room. In Clinic C, MAs and nurses shared a small room in the clinic, and the reception desk was outside the clinic and shared by many specialties. All three clinics had weight and height measurement stations in the clinic area facing the waiting room door, on the way to the exam rooms. Poor reporting of pain scores at one clinic led to additional inquiries with key informant staff who shared that internal EHR policies varied between clinic. An EHR “soft stop” prompted recording pain before closing encounters at the two high-performing clinic sites, whereas the site with low pain score reporting lacked an EHR stop to discourage closing the encounter without recording a pain score.

Work System Modifications

At our institution, clinic leaders used these data to talk with practice group clinicians about how to standardize six tasks with high frequency variation (weight measurement, height measurement, pain assessment, cuing prescription refills, questionnaire administration, and

tobacco history). We shared that some variation was desired (e.g., taking temperatures only at visits with specific complaints), while other variation was unwanted (e.g., asking for pain scores, the frequency of which ranged from 17 to 98% among clinics). When these data were presented, the group consensus among clinic leaders supported recording weights, pain scores, and tobacco use for all patients, but only recording a height once per patient. The group avidly discussed cuing of prescription refills. Learning that refill cuing took less than one minute, whereas usual processes requiring handling faxed refill requests from pharmacies, cuing refills, and documenting amount to several minutes, the group decided to standardize this as a rooming practice. Clinic leaders also discussed whether to revise scheduling to allow up to 10 minutes with staff prior to scheduled clinician encounters.

DISCUSSION

We report a user-friendly method to measure the pre-visit rooming process enabling purposeful redesign to support care delivery without burdening providers. The time study tool facilitates collecting clinic workflow data to appraise variations in rheumatology clinic settings to identify improvement opportunities as has been encouraged by the AMA best practice module [11]. This project generated baseline project data for comparing future rooming task frequencies and durations after piloting new rooming protocol interventions for population management of cardiovascular risk factors.

In the absence of an established body of rheumatology team-based care or rooming literature, our results can be interpreted within the primary care literature and the AMA best practice recommendations. Many primary care clinics have already expanded the MA role to improve quality and efficiency while controlling costs and to improve physician experiences through team-based care [12]. With 591,300 MA jobs in the U.S. [25], MAs provide an accessible resource for clinics to also expand staff roles. One Boston primary care group expanded rooming protocols to facilitate MA medication review, agenda setting, form completion, addressing health-monitoring reminders, and immunizations [6], which resulted in a 14% increase in physician satisfaction scores. Overall, positive impacts have been reported throughout the primary care redesign literature; however, most published tools were designed for a single setting, or require software or devices, and none have been widely adopted. Our simple, modifiable tool is feasible and can be used in rheumatology or other clinical specialties without technology requirements or extensive staff training. To access the free tool, register at <https://www.hipxchange.org/BPConnectHealth> and view the “Time study observation tool” page within the toolkit.

The potential of pre-visit team-based care is starting to be recognized in the rheumatology literature as well. One quality improvement project in rheumatology clinics increased pneumococcal vaccination from 67% to 80% with point-of-care reminders and with pre-visit workflows to target immunocompromised patients who were not up-to-date on vaccinations [26]. Systematically modifying the rheumatology clinic rooming process will require baseline process data to inform data-driven decisions. In this article, we have demonstrated the use of a taxonomy, tool, and method to measure such data and analyze rooming process changes to maximize efficiency and care quality.

Strengths and Limitations

Strengths of this study include the large number of observed visits across multiple clinics as well as the multidisciplinary development of a standardized, highly usable tool. Potential limitations of the study include generalizability of the results to rheumatology clinics other than the three study sites, yet the tools and steps we described can be tailored by other rheumatology clinics to measure their own rooming process. Time studies using in-person observation have the limitation of potential behavior changes when people are aware they are being observed [18]. We addressed this limitation by including a period of preliminary observations during which the staff could get used to being observed, followed by numerous observations at different times of the day, the week, and the month. We excluded from the analysis the dozen preliminary observations from the beginning of the study, where this effect can be strongest. Moreover, frequency measurements may have been limited by the fact that some tasks are silent or may be completed at the same time as other tasks. We have verified the consistency of our results with staff interviews and EHR data on rooming start and end times. Furthermore, examining individual staff differences was not in this project's scope and power, but we reported ranges across 14 staff and found no significant differences comparing MAs and nurses. We also acknowledge that specific task frequency may vary by season. An example is flu shots, which occur more often in the fall, although the majority of the observations in this study occurred during the spring season. For rheumatology clinics considering seasonal tasks, the tools and steps we provided can be used at different times of the year to obtain useful data for those purposes. Additionally, the measurement resolution of 15-second minimal intervals with the easy-to-use paper-based tool should be sufficient for most purposes, but the tool could be implemented electronically on a digital table if finer resolution is needed. Overall, the rooming task taxonomy, measurement tool, and analysis methods are easy to use in rheumatology clinics to guide data-driven capacity building by optimizing the team-based rooming process.

Future Research

Methodologically, replication in other rheumatology clinics would help further validate and refine the rooming task taxonomy, the measurement tool, and the time study design. Specifically, replication studies can 1) assess the external validity of the taxonomy and refine context-specific adaptations, 2) assess the reliability of the measurement tool, and 3) optimize the efficiency by estimating sufficient sample sizes. In terms of clinical practice, replication studies can analyze rooming task variations among different rheumatology clinics in different healthcare systems, both within the US and internationally, where the roles of the outpatient health care team may be different. Investigating differences identified by work system analyses across settings in relationship to rooming task frequencies and duration could identify improvement strategies and build capacity to address any unique population management needs. Finally, future work potentially using EHR time stamps during rooming could allow multivariate analyses of differences at individual staff level.

CONCLUSION

Using time study, we developed a practical approach for measuring rheumatology clinic rooming tasks to build capacity for disease management and preventive care. We found that

both the frequency and duration of tasks varied among encounters and clinics, and these findings informed practice changes to optimize efficiency and quality. This study offers tools and steps for (1) identifying and prioritizing opportunities for standardization of rooming tasks within clinics and health systems, and (2) supporting data-driven decisions regarding changing standards or evaluating new initiatives to address rheumatology population management needs without burdening busy clinicians.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviations

MA	medical assistant
RN	registered nurse
AMA	American Medical Association
EHR	electronic health record
ANOVA	analysis of variance
SD	standard deviation

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Key Points

- Rheumatologists face time pressures and could benefit from optimized team-based rooming.
- We assessed variations in the duration and frequency of tasks in pre-visit rooming across three rheumatology clinics.
- Two of 15 tasks varied significantly in duration and nine varied significantly in frequency.
- Findings led clinic leaders to standardize six high-variation tasks across clinics.
- Our time study methods, taxonomy, and tool can be used to identify opportunities to streamline clinic rooming.

Figure 1. Time study tool for specialty rooming observations

Each page represents a new visit, and each row represents a 30-second time unit (e.g. the first row represents 0 to 30 seconds). Columns indicate which task was performed during each respective time block. Measurement resolution in 15-second intervals is represented by “/”, “\”, or “X” to record the first or second 15 seconds or a full 30-second task, respectively. Column row totals can be summed to show duration of a task as shown in the inset example.

Figure 2. Box and whisker plot for median total rooming durations

The total duration of the rooming sequences varied by clinic with significant variation within clinics. Boxes represent interquartile ranges (IQR). Whiskers indicate 1.5 IQR ranges. Dots represent outliers. Across all clinics, the median duration was 6.75 minutes with clinics ranging from 6.00 to 8.25 minutes (0.25 minutes is the minimum unit of measurement).

Table 1

Taxonomy of Rheumatology Rooming Tasks

Task categories	Tasks
1. Rooming Initiation (ID and Walk Patient to Room)	1.1 Invite the patient from the waiting room 1.2 Confirm patient identifier(s) 1.3 Walk the patient to exam room
2. Vital Sign Measurements	2.1 Measure weight 2.2 Measure height (stadiometer) 2.3 Measure temperature 2.4 Respiratory rate or pulse oximetry assessment 2.5 Measure pulse 2.6 Measure blood pressure
3. Medications and Allergies	3.1 Ask patient about their allergies 3.2 Confirm patient's current medications 3.3 Ask and record patient's primary pharmacy 3.4 Discuss refill needs with the patient
4. Chronic Disease Management	4.1 Inquire regarding pain assessment 4.2 Explain disease activity questionnaire 4.3 Ask if patient has had/needs any vaccinations 4.4 Obtain patient's tobacco history
5. Other Questions and Conversation	5.1 Discuss clinical questions 5.2 Converse with patient

Table 2

Mean durations of rooming task categories in rheumatology clinic visits

TASKS	All Visits		Clinic A		Clinic B		Clinic C		Between Clinics
	n=190		n=41		n=86		n=63		
	Mean, SD	Range	Mean (SD)		Mean (SD)		Mean (SD)		p
TOTAL TIMES	7.5 (3.1)	2.5-22	8.8 (2.5)		6.7 (3.3)		7.6 (2.8)		<0.001
Rooming Initiation	0.8 (0.4)	0.25-3	0.7 (0.5)		0.7 (0.3)		0.8 (0.3)		
Vital Signs Measurement	1.9 (0.6)	0.25-3.75	2.2 (0.5)		1.8 (0.6)		2.0 (0.5)		0.002
Allergies & Medications	2.1 (1.4)	0.25-12.25	2.5 (1.2)		1.9 (1.7)		2.1 (1.0)		
Chronic Disease Management	0.8 (1.1)	0.25-9.75	0.6(0.4)		1.0 (2.0)		0.9 (0.6)		
Other Questions or Conversation	1.3 (1.2)	0-5.25	1.7 (1.3)		1.2 (1.2)		1.2 (0.9)		0.04

TOTAL OBSERVATION TIME = 1419 minutes

Table 3

Frequency of rooming tasks in rheumatology clinic visits

TASKS	<u>All Visits</u>		<u>Clinic A</u>		<u>Clinic B</u>		<u>Clinic C</u>		<u>Between Clinics</u>	
	n=190	%	n=41	%	n=86	%	n=63	%	p	% of visits
Rooming Initiation (ID and Walk Patient to Room)	99	100	100	100	99	100	100	100		
Vitals (WT/HT/P/BP/Temp)	100	100	100	100	100	100	100	100		
→ Weight Measurement	81	88	88	88	66	66	95	95	*	
→ Height Measurement	22	5	5	5	21	21	33	33	*	
Pulse Measurement	94	98	98	98	92	92	94	94		
Blood Pressure Measurement	99	100	100	100	99	99	98	98		
Temperature Measurement	8	0	0	0	19	19	0	0	*	
Allergies/Med Reconciliation/Pharmacy	100	100	100	100	100	100	100	100		
Allergies	83	93	93	93	76	76	87	87	*	
Med Reconciliation	98	100	100	100	98	98	98	98		
Pharmacy Specification	83	85	85	85	76	76	92	92	*	
→ Curing Prescription Refills	18	46	46	46	3	3	21	21	*	
Chronic Disease Management	75	100	100	100	47	47	98	98	*	
→ Verbal Pain Assessment	61	98	98	98	17	17	95	95	*	
→ Questionnaires	35	7	7	7	nr	nr	57	57	*	
Vaccination History & Offer	11	5	5	5	8	8	19	19		
→ Tobacco History	43	56	56	56	38	38	41	41	*	
Other Questions or Conversation	84	93	93	93	78	78	86	86		

TOTAL OBSERVATION TIME = 1419 minutes

Percentage of visits in which each task occurs.

Bold: percentage of visits in which any task under given category occurs.

* p<0.05. → chosen for standardization nr=not recorded, administered in lobby.