

## Quantifying Medical Interpreter Activity: A Time-Motion study

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In 2010, 25.2 million people who were considered to be of Limited English Proficiency (LEP) faced challenges when seeking healthcare in the primarily English language based US healthcare system.<sup>1</sup> LEP patients are likely to experience longer hospitalizations, medication errors and decreased use of preventative services than those conversant in English.<sup>2</sup> Studies suggest that LEP patients have a 2.5 times greater risk of being physically harmed by an adverse medical event than non-LEP patients.<sup>2,3</sup>

Use of medical interpreter services has been shown to improve communication, satisfaction, and medical guidance adherence among LEP patients.<sup>4</sup> To reduce disparities in healthcare delivery, both state and federal regulations have mandated that large hospitals and providers who deliver care to LEP patients offer interpreter services.<sup>5</sup> Providing high quality, cost-effective healthcare to LEP patients can pose significant challenges, including identifying patients in need of services, tailoring care to best suit patients' needs, and determining who is responsible for the costs associated with interpretive services.<sup>6,7</sup>

Unfortunately, efficient interpreter staffing models have yet to be established.<sup>8</sup> Optimal staffing not only contains institutional costs by improving utilization of interpreter services, but also helps ensure the provision of superior healthcare and an exceptional patient experience. Unlike nurse and physician staffing models, there is limited literature on quantitative ways to optimize interpreter staffing in hospitals and health systems.<sup>9-11</sup> This leaves only ad hoc methods for determining the level of staff required for each shift.

Building an optimized model for medical interpreter services staffing would require a thorough understanding of interpreter activities. Born of scientific management principles that were developed in the early part of the 20th century, time-and-motion studies provide a way of capturing detailed information about specific tasks in real time.<sup>12,13</sup> During a time-and-motion study, a worker's activities are recorded along with the start and end times of each activity as well as the location in which they are performed, in order to capture the complete workflow process. These study designs are used by various industries including health systems as part of process optimization as they allow investigators to quantify costs, determine the distribution of resources, and identify factors affecting patient safety and quality measures.<sup>14-16</sup>

A review of the literature revealed that, to date, there have been no time-and-motion studies conducted on medical interpreter services that quantify the amount of time spent on work-related activities. We utilized a time- and-motion study design to capture direct and continuous observations of selected interpreters. The objective of this study was to gain insight into the workflow of Spanish language medical interpreters by determining the amount of time spent on

work-related activities. These results can be used to inform the development of staffing models for medical interpreter services.

## **Methods**

### **Setting**

The study was conducted at a large, independent community academic medical center. The language services department at the medical center employs 14 interpreters in 9 full-time positions. The current number of discrete patients seen each year is unknown. Because the campus includes an Emergency Department (ED) with a level I trauma center, inpatient, and outpatient services, medical interpreters provide services in a variety of settings.

### **Participants**

Six Spanish interpreters were willing to participate and consented. We chose to restrict the study to only full-time Spanish language interpreters due to current staffing. Approval was obtained from the Christiana Care Health System (CCHS) Institutional Review Board, as well as from the Department of Human Resources, as required by hospital policy for any study involving employees. Although patients were not the focus of the study, a verbal consent form for the observer to remain in the room during the interpretation was read to the patient in Spanish, and a written version was provided in both Spanish and English.

The consent emphasized that data collection efforts would center exclusively on interpreter activities and would not include protected health information associated with the patient.

### **Data Collection**

Two research aides were provided cultural awareness training prior to on-site data collection. Preliminary observations were conducted to create a list of tasks that captured the scope of interpreter activity to be utilized during data collection. None of the preliminary data was included in the results for analysis.

Observations were scheduled over a 1-week period in February 2016 during the hours of 7:30 AM and 5:00 PM, depending on the work shifts of the participating interpreters. This period was also chosen based on prior data showing that 81% of interpreter service occurred during these hours. In order to collect a representative sample, data collection took place in four to eight hour shifts during both the morning and afternoon with a total of 47.5 hours of observation completed. A standard data collection form was designed to capture date, start time, end time, type of activity, location, and additional comments. The comments section allowed the observers to capture descriptions of activities as needed, or to add depth to the observations for analysis. To determine the level of inter-rater reliability (Cohen's Kappa), the observers jointly shadowed an interpreter for an additional four-hour shift. We excluded interpreter's personal time, as this data was not collected to improve interpreter services, but rather determine the actual amount of time spent by interpreters on certain activities.

### **Data Analysis**

Activities were classified as either "value added" or "non-value added" (Table 1). Activities necessary for patient care were classified as value added; all other activities were non-value

added. Discussions occurred with CCHS's Director of Cultural Competence to ensure activities were classified correctly and resolve disagreements of classification of activities. Descriptive statistics were calculated using Tableau 8.3 and SAS 9.4.

Table 1. Definition of Value Added and Non-Value Added Activities

Value Added Activities	Definition
Travel	Walking to/from meetings or interpreting appointments
Interpreting for Patient	Engaged in interpretation with patient and provider
Interpreting for Others	Engaged in interpretation with family members or others
Meetings	Attending staff meetings
Inputting Data for Database	Logging information into service hub through computer or iPad
Personal Protective Equipment	Donning protective equipment before and after leaving a patient's room
Consult	Speaking with providers about patient/interpreting process, without patient present
Education	Educating provider on how to use service Hub or call for interpreter services, or on hospital policy regarding appropriate communication
Trauma	Waiting in the trauma bay to find out if patient is LEP; considered Interpreting for patient if patient is LEP
Dispatch	Working as dispatcher
All Patient Activity	Any activities involving patients that do not fit into other categories
Translating	Translating written documents
Video Remote Interpretation	Assisting with video remote interpretation (VRI)
Non-Value Added Activities	Definition
Travel-Cancelled Appt	Appointment is canceled while in transit (including if patient is non-LEP)
Looking for supplies	Looking for supplies
Interruptions	Provider leaves patient room shortly, requiring interpreter to leave
Waiting-unscheduled	Waiting for appointment to be scheduled or between appointments
Waiting-testing/other	Waiting in the vicinity of the patient when test results are pending
Incident Report	Filing a report regarding hospital policy related concerns

## Results

The joint observation resulted in a Cohen's Kappa coefficient of 0.83 with a 95% confidence interval (0.69, 0.97), indicating a high level of inter-rater agreement.<sup>17,18</sup> Interpreters spent time on 20 different activities, as shown in table 2.

Table 2. Time per activity, Percentage of Total Time, Count, Mean, and SD spent by interpreters on each defined activity in minutes

Activity	Time per Activity	Percent	N	Mean	SD
Interpreting for Patients	968.37	32.97	111	8.72	7.76
Waiting-unscheduled	518.10	17.64	40	12.95	10.5
Travel	327.35	11.15	72	4.55	3.19
Meetings	206.50	7.03	10	20.65	18.43
Waiting for Test results	180.32	6.14	24	7.51	6.11
Interruptions	150.57	5.13	55	2.92	3.22
Input for Database	145.22	4.94	52	2.79	5.54
Dispatch	110.63	3.77	3	36.88	50.46
Translating	107.55	3.66	7	15.36	14.68
Consult	75.83	2.58	46	1.65	1.70
Interpreting for non-patients	41.20	1.40	13	3.17	2.86
Travel—canceled	33.22	1.13	11	3.02	1.19
Video remote Interpretation	15.67	0.53	2	7.83	1.85
Education	15.22	0.52	7	2.17	1.82
Personal Protective Equipment	12.83	0.44	11	1.17	1.06
Incident report	11.83	0.40	1	11.83	0.00
Other Cancelled Activities	11.48	0.39	4	2.87	1.85
Looking for supplies	4.93	0.17	2	2.47	1.78

Interpreters spent the largest amount of time interpreting for patients (32.97%), followed by waiting (17.64%), and travelling (11.15%). Interpreters spent 67% of their time performing value added activities and 33% of their time performing non-value added activities.

### Variation of Activity Time

Table 2 shows the standard deviation, in minutes, of time spent on each observed activity. Despite exhibiting low frequencies, ‘dispatch,’ ‘translations,’ and ‘meetings’ demonstrated the greatest variability. The lack of variability of the activity defined as ‘incident report’ is due to the collection of only a single data point for this particular activity.

### Location

Interpreters frequented a variety of different locations within the main hospital and in several off-site locations. The percentage of total time spent in each location is summarized in Figure 1. A spaghetti diagram was created to map the actual physical movement of interpreters through the hospital. Figure 2 represents the physical movement of interpreters during one day (8 hour shift),

but the pattern was similar on all other observed days. This diagram highlighted interpreter activity throughout the hospital, and shows how many places within the hospital the interpreters go to on a daily basis. While interpreters continuously retrace their movements, this is necessary due to the requirements of the job and the layout of the hospital.

Figure 1. Percentage of Total Time Spent in Each Location Within the Hospital

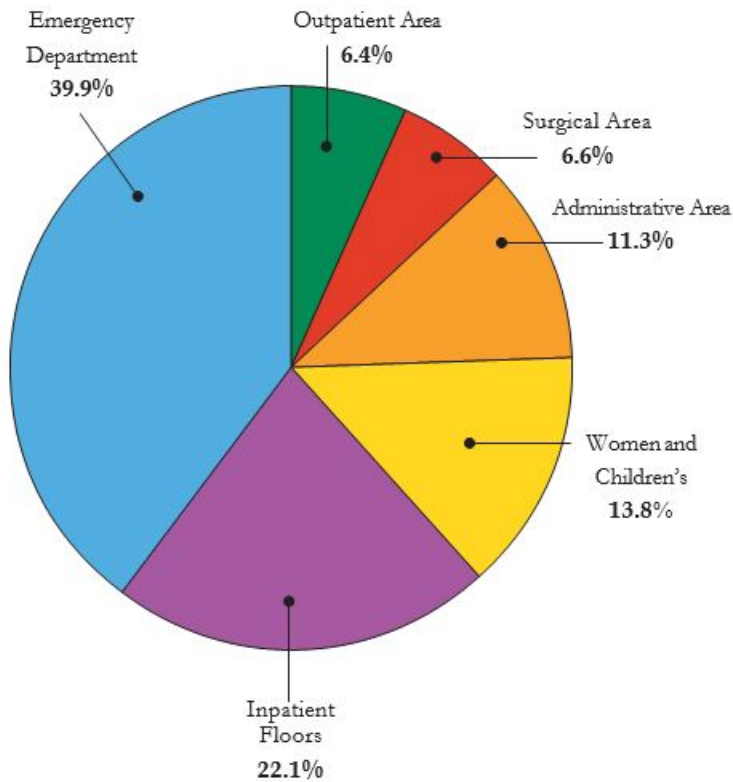
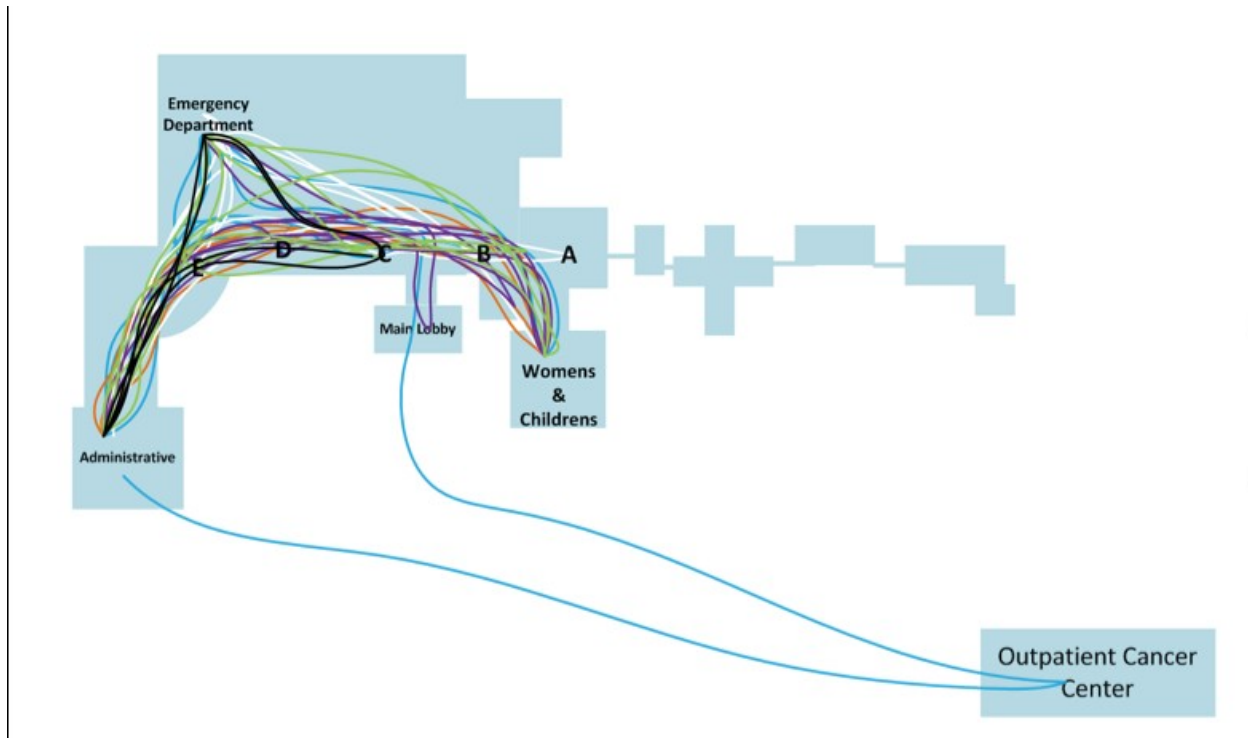


Figure 2. Spaghetti Diagram of Interpreters' Movement Throughout Hospital During One Week of Observation



## Discussion

Medical interpreters play a crucial role in facilitating effective communication between LEP patients and their providers; however, a lack of information in the literature on interpreter workflow hinders the optimal utilization of this essential service. The purpose of this study was to gain insight into the workflow of medical Spanish interpreters.

This study is intended to be used as a platform for future research into workflow and staffing level optimization of medical interpreter services at CCHS, which may help reduce disparities in healthcare delivery.<sup>19</sup>

Despite the administrative and logistical activities required of them, medical interpreters in this study spent the largest percentage of their time actively interpreting for patients. Although engaging in interpretation with the patient and provider is the primary function of interpreters, there was no quantification of such activities prior to this study, and no guarantee that interpretation was their primary occupation while at work. The percentage of time that the medical interpreters in this study spent interpreting for patients (32.97%) may seem low but is consistent with the amount of direct patient contact exhibited by other healthcare professionals, including the amount of time physicians and nurses spend with patients (27.5% - 37.0%).<sup>20-22</sup>

Time spent interpreting for patients, however, is not the whole picture. It is also worth noting that time spent ‘traveling’ or walking from one interpretation encounter to the next consumed more than 10% of the interpreters’ time. When combined with other linguistics activities such as interpreting for other people who are not patients, engaging in translation activities, assisting with video remote interpretation, and consulting with providers, more than 50% of interpreters’ time is spent directly on interpreting, and 67% of interpreter time was spent on value-added activities. The quantification of interpreter activities can be leveraged to inform future staffing needs by demonstrating the value of this service and the performance of individual interpreters.

We found wide variation in activity duration, which reflects a common challenge in healthcare planning. Inconsistency in the time required to complete an activity complicates the development of effective staffing models. Although variability is inevitable in service industries, including healthcare, it does pose challenges to institutional operations and needs to be taken into consideration when attempting to improve utilization of interpreter services.<sup>23</sup> Some of the variation observed in this study may be exacerbated by the short duration of the study or the low influx of LEP patients into the hospital. However, variation in the length of encounters requiring interpretation is primarily due to patient and provider needs, or to the complexity or acuity of illnesses being treated. The inability to accurately predict the length of value added activities can have a negative impact on the expediency and quality of care received by LEP patients. For example, underestimations in the time required to complete an interpreting consult results in interpreter delay, causing extended wait times for other LEP patients requiring interpretive services.

It should be noted that several of the activities classified as non-value added are mandated by hospital policy as a safety measure to protect LEP patients from possible harm. For example, interpreters must respond to all trauma and stroke codes and alerts. While most trauma and stroke alerts are for non-LEP patients, having language services staff present on arrival facilitates rapidly establishing communication in these time sensitive situations for LEP patients.

However, in this study, all tasks performed by the interpreter for non-LEP patients were considered non-value added and were recorded as such. Interruptions were a frequent non-value added occurrence, and consisted of any unanticipated break in a scheduled activity, excluding the starting of another activity.

Interpreters are required to leave the patient's room when a provider is not present (such as when nurse briefly leaves to get supplies or check test results), resulting in substantial interruptions in the interpreter's workflow. The vast majority of the interruptions observed occurred under these circumstances.

Time spent waiting without an otherwise scheduled activity is neither value added nor hospital mandated, representing an opportunity for workflow improvement. Written translation services for the hospital are one way to more efficiently utilize wait time. Full-time interpreters who were qualified to work on translations have time designated for this task and are able to translate during time otherwise unscheduled for interpretation. Significant gains may also be made through greater communication between the language services department and healthcare providers on how to most effectively schedule interpretations and how to best utilize the services of the interpreter when present at the bedside.

This study had several limitations. Data collection and interpreter observation was only conducted over a one-week period, and may not be fully representative of annual trends in language services utilization and staff efficiency.

All observations were at a single site and during regular business hours. Our results and study design may not be applicable to other healthcare settings with fewer staff or a smaller Spanish LEP population.

For future studies, we recommend that all available shifts be observed, including nights and weekends, to cultivate a more representative sample of interpreter activities and duration of activities performed. Because outpatient clinics represent an area with workflow challenges that

differ significantly from that of the inpatient setting, additional data should be collected from these sites. Future quantification of non-value added activities could also be used for performance improvement initiatives.

## Conclusion

Time-and-motion studies can be used as an effective method for gaining insight into workflow and service utilization, providing a foundation for the development of effective staffing models. This study serves as a platform for future investigations into interpreter services, as well as quantifications of value added activities that improve patient experience and outcomes.

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