A Multi-Center Time Study of Home Infusion Pharmacist Professional Services

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ABSTRACT

Introduction

Pharmacist professional services are paramount to the success of the home infusion process. Even though there is a general understanding of the type and scope of care that a pharmacist provides, the various tasks and how they differ between therapy types and drug administration method are unknown. Using home infusion pharmacist time utilization data collected in this study, the amount of time the home infusion pharmacist spends managing and caring for the patient was determined. The categories of professional services the pharmacist provides and the time and task differences between therapy types and methods of administration was also determined.

Methodology

This prospective time study analyzed pharmacist recall of time spent on a predetermined list of patient tasks using a formatted Excel® spreadsheet. Data was collected January-October 2021. The goal was to capture time data related to at least 2 dispensing cycles.

Results

The mean pharmacist time per patient per day was 35.85 minutes (SD=35.86). Based on this number, the direct salary costs associated with pharmacist services for the therapy categories described in this study is estimated to be $35.17 per patient per day. Over the course of the study, 400 pharmacist tasks were completed for 30 patients of which 49.30% involved drug preparation and compounding and 20.30% involved care coordination and communications. The mean tasks per patient was 13.33 (SD=7.03) and the mean tasks per patient per day was 1.33 (SD=.85). Anti-infective patients using an ambulatory pump required the most tasks per day (2.77, SD=1.20) and anti-infective patients using an IV push required the least (1.09, SD=.84). The mean time per task was 22.96 minutes (SD=28:29). Even though anti-infective patients who use a pump required the most time per day, they averaged the least number of study days (4.25) while anti-infective patients using an IV push averaged 14.39 study days.

Discussion

Patient assessments require the most time; 40:48 minutes per task. Assessments ensure that the patient's therapy is appropriate, evaluates patient safety, and ensures the home environment and caregiver support is sufficient. Sterile drug preparation and compounding comprises half of all pharmacists' services which is expected since compounding has grown increasingly complex.

Conclusions

This pharmacist time study illustrates the type of tasks and the amount of time dedicated to home infusion professional services. Pharmacist's average 35.85 minutes per day caring for each patient. Even though the data shows that patient care is highly customized, there are trends that can be applied to understanding a pharmacist's workflow.

Keywords: *Pharmacist services, time study, patient assessment, clinical monitoring, sterile compounding, plan of care, care coordination, infusion*

Introduction

As an active member of the home infusion team, the pharmacist provides a vast array of patient-focused professional services, which are paramount to the success of the infusion care process. A professional pharmacy service is defined as an action or set of actions undertaken in or organized by a pharmacy, delivered by a pharmacist, who applies their specialized health knowledge personally or via an intermediary, to optimize the process of care, with the aim to improve health outcomes and the value of health care.[1] The pharmacist actions referred to in the definition are multifaceted and when applied to the home infusion pharmacist begins with deeming the patient's appropriateness for home infusion.

Prior to admitting a patient to the home infusion service, the pharmacist is central to completing a sequence of tasks. Pharmacist tasks include performing assessments and consulting with the patient, physician, and nurse to determine a plan of care for the home infusion medications, which involves determining how the drug will be administered (i.e., IV push, elastomeric device, gravity, or mechanical pump). Concurrently, the pharmacist reviews and/or recommends an individualized medication monitoring plan and coordinates the preparation of the compounded sterile preparations, equipment, and supplies. Throughout therapy, the pharmacist or their designee speaks with the patient to assess the medication's effects and if the patient is not responding to the drug or developing an adverse effect, the pharmacist will evaluate the situation and notify the physician.[2]

There is a common understanding of the home infusion pharmacist's professional contributions to the care of patients. However, the pharmacist's time commitment to the various tasks and how they differ between therapy types and drug administration method is unknown. Since home infusion billing bundles pharmacist professional services with items used by the patient to administer the medication and maintain the intravenous access device (e.g., pumps, tubing, dressing change supplies) it is not possible to isolate and measure pharmacist work using billing data.

Studies that investigate tasks and quantify the amount of time to complete a given task are known as time utilization or time and motion studies and are common in health care because they assist in understanding the time requirements specific to a health care profession.[3] These studies were initially used to determine costs and inefficiencies in health care delivery and then expanded the focus toward patient safety and quality.[3] Time utilization studies offer a precise standard in quantifying health care workers' time expenditures on clinical activities and provide valuable insight into system specifications and workflow design.[4,5] In brief, time utilization data is valuable for understanding the typical work required to efficiently provide a high-quality health care service.

The literature reveals that studies tracking a pharmacist's time have been conducted. Unfortunately, the investigations did not include home infusion pharmacy as the work setting. The published studies included retail, clinical, hospital, ambulatory, academics, and a free clinic dispensary, with the primary goal to locate inefficiencies.[4,6] Research specific to home infusion pharmacist professional services and the time utilized has not been reported. The results from this investigation will assist in quantifying the home infusion pharmacist's time commitment to tasks that are involved with caring for the home infusion patient. Equally important, the results can be applied to pharmacist staffing decisions and inform policies that support appropriate reimbursement for home infusion services. The secondary purpose of this study is to gain insight and describe the home infusion pharmacist's workload.

Study Objectives

The objectives of using home infusion pharmacist time utilization data collected in this study are:

1) Determine the amount of time a home infusion pharmacist spends managing and caring for a home infusion patient;
2) Quantify the categories of professional services (tasks) the pharmacist provides; and
3) Determine the time and task differences between therapy types and methods of administration.

Methodology

A descriptive, multi-center, home infusion pharmacist time utilization study was administered by the National Home Infusion Foundation (NHIF). The NHIF web page invited all home infusion providers to participate in a study that involved pharmacists self-reporting time spent on clinical tasks related to patient care. The pharmacists at the participating provider locations received an orientation video, data entry guide, patient tracking Excel® spreadsheets, and when needed, individual telephonic support.

A home infusion pharmacist expert committee was utilized to determine the study therapy types to be included, dispensing cycles, pharmacist task categories, and examples of tasks within each category. Since it was hypothesized that the amount of pharmacist professional time varies according to the patient therapy type and administration method, time measures were delineated for the 8 therapies and administration types shown in Figure 1.

FIGURE 1 | Therapy and Administration Type and Dispensing Cycle

Therapy Type	Administration Type	Data Collection Time Frame
1. Anti-infective	Ambulatory infusion pump	10 days with 2 dispenses
2. Anti-infective	IV push	10 days with 2 dispenses
3. Inotropic therapy	Ambulatory infusion pump	14 days with 2 dispenses
4. Anti-neoplastic chemotherapy	Ambulatory infusion pump	21 days with 2 dispenses
5. Parenteral nutrition patient	Ambulatory infusion pump	14 days with 2 dispenses
6. Monoclonal antibody	Any method	Starting with initial home dose through 2nd dispensing cycle
7. Subcutaneous immune globulin	Ambulatory infusion pump	45 days with 2 dispenses
8. Intravenous immune globulin	Ambulatory infusion pump	45 days with 2 dispenses

Data Collection

Data collection was conducted January through October 2021 and involved tracking pharmacist patient care time starting at the time of referral and continuing through the minimum number of days shown in Figure 1. The goal was to capture time data related to at least 2 dispensing cycles which included the initial dispense at the start of care and at least 1 subsequent dispense. Data collection then continued through the minimum number of days after 2 dispensing cycles were captured. The time for the second dispense to occur varied based on the therapy type. Patients were not followed through discharge for this study.

Pharmacists self-reported the amount of time (minutes) spent on each patient task using an Excel® file for each patient serviced. The tasks were classified according to predetermined categories (Figure 2). Using retrospective recall, pharmacists tracked the time spent on a task category for a given patient immediately after completing the task. For example, if the pharmacist was reviewing

FIGURE 2 | Pharmacist Professional Services Task Category

Task Category	Examples
1. Performing patient assessments and documenting the assessment results in the patient EMR	• Reviewing current illness • Reviewing past medical history • Reviewing current medication list • Reviewing prescribed infusion medication • Assessing home environment/ caregiver status • Assessing ambulatory status and other physical limitations that may interfere with self-administration • Assessing vascular access device compatibility with prescribed medication • Interventions to facilitate initiation of home infusion therapy
2. Developing, implementing, and documenting the plan of care	• Reviewing existing, and obtaining supplemental physician orders for prevention of acute infusion reactions, access device de-clotting agents, access device maintenance solutions, etc. • Developing a monitoring plan • Developing an access device maintenance plan • Patient education plan • Interventions performed • Documenting and updating the care plan in the EMR
3. Clinical monitoring and related intervention activities	• Obtaining, tracking, and trending lab results • Lab evaluations • Interventions performed • Recommendations made because of monitoring activities • Documentation of monitoring and interventions in the EMR
4. Drug preparation and compounding activities	• Dispensing • Determining appropriate beyond use dates • Compounding process oversight (patient specific) • Supply selection • Shipping • Documentation of compounding, dispensing, and delivery activities
5. Care Coordination and communication	• Telephonic interactions and the time spent performing the task • Patient communication • Prescriber communication • Internal communication (i.e., billing) • Only include if not able to fit into a category above
6. Other patient-related work tasks	• Case conferences • Work not covered above

the prescribed infusion medication, the task category was "1." After completing the task, the pharmacist noted the total task time directly related to their role in the task in the tracking form (Figure 3). Once a patient had completed 2 dispensing cycles and the minimum number of days, the data collection tracking form was submitted to NHIF via a data submission portal.

FIGURE 3 | Home Infusion Pharmacist Professional Services Excel® Tracking Form

NHIF HOME INFUSION PHARMACIST TRACKING FORM-CLINICAL SERVICES TIME STUDY					
Location DPC					Patient Therapy Type Codes
Patient ID #					1: Antiinfective using an ambulatory infusion pump 2: Antiinfective utilizing IV push administration 3: Inotropic using an ambulatory infusion pump 4: Anti-neoplastic chemotherapy (i.e.5-Fu) using ambulatory infusion pump 5: Parenteral nutrition patient 6: Monoclonal antibody administered intravenously with initial home dose 7: Subcutaneous immune globulin-pump administered 8: Intravenous immune globulin-pump administered
Patient Age					Care Activity Task Codes
Patient Data Start Date					1: Performing patient assessments and documentation 2: Developing, implementing, & documenting care plan 3: Clinical monitoring and intervention activities 4: Drug preparation and compounding activities 5: Care coordination and communications 6: Other patient related works tasks
Patient Data Stop Date					
Patient Therapy Type Code	Therapy	Medication	Date Added	Administration Method	
Secondary Therapies (IV)					
Data Entry					
Date	Task Code #	Start Time	End Time	Comments/Notes	

Using Excel®, researchers calculated the patient total days, total patient minutes for each task category, and total patient minutes for pharmacist professional services. Next, the data for all submitted forms was combined and compiled into a single Excel® file. This file was imported to IBM SPSS® (Statistical Product and Service Solutions) for additional analysis.

Analysis

The main objective of this study was to measure how much time home infusion pharmacists spent managing and caring for a patient per day and the time spent in each category of tasks that are completed. The time measurements collected during the study were used for the following calculations: The total pharmacist time spent on a single patient was divided by the number of study days to calculate the amount of time per day for 1 patient. This was calculated for all the patients in the study, and an average value was determined from the sum of time per day for all patients divided by the number of patients in the study. The resulting value is defined as the mean amount of time a pharmacist spends per patient per day. Time measurements of related tasks were collected during the study and the following calculation used to determine the mean value for pharmacist time per task: The sum total patient time for each task category was divided by the sum of the number of completed tasks within each of the 6 categories. The mean value for pharmacist time for each therapy type was calculated using the sum of the total time of tasks by therapy divided by the number of completed tasks. The mean value for pharmacist time for each method of administration was calculated using the sum of the total time for tasks divided by the number of completed tasks within each administration method.

IRB (Institutional Review Board) Status

The patient's plan of care was not impacted by this study. All patient care data was retrospectively recorded. No identifying patient data was provided by the participating provider locations. Furthermore, the provider location was deidentified using a data participation code (DPC) provided by a 3rd party consultant. This study was therefore exempted from IRB review. To ensure that both provider and patient were deidentified, the patient code was the provider's unique DPC followed by a 2-digit patient identifier, only known by the pharmacist.

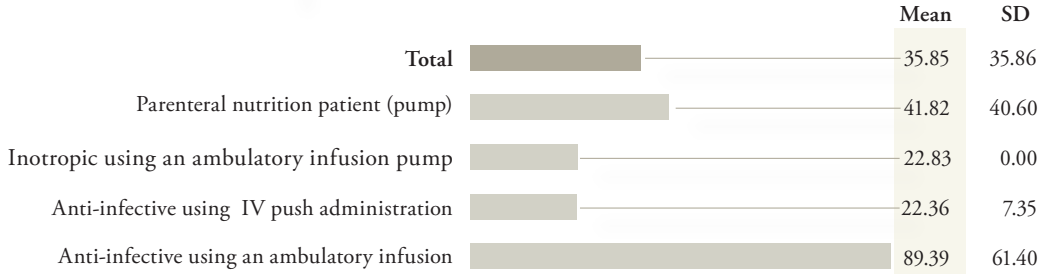
Results

This multi-center study included 367 cumulative study days representing 30 patients from 5 unique providers throughout the mid-west and east regions of the United States. The mean number of study days per patient was 12.23 (SD=7.06) which included at least 2 dispensing cycles. The mean patient age was 59.53 (SD=13.80) with a range of 27-77 years. As shown in Table 1, anti-

TABLE 1 | Patient Therapy Category and Study Days

Therapy Category	Patients (n)	Total Study Days	Mean Study Days	SD
Anti-infective using an ambulatory infusion pump	4	17	4.25	1.50
Anti-infective using IV push administration	18	259	14.39	7.20
Inotropic using an ambulatory infusion pump	1	18	18.00	0
Parenteral nutrition using ambulatory infusion pump	7	73	10.43	4.96
Total	30	367	12.23	7.06

FIGURE 4 | Mean Pharmacist Time (Minutes) Per Patient Per Day by Therapy Category



infectives administered by IV push were the predominate patient therapy category represented in the study followed by parenteral nutrition using an ambulatory infusion pump. No data was submitted for the chemotherapy, IGG, or monoclonal antibody therapy categories. The remaining study results align with the study objectives.

Home Infusion Pharmacist Patient Care Time and Workflow

Determining the average time spent by pharmacists caring for an individual home infusion patient was a primary objective of the study. As shown in Figure 4, the mean pharmacist professional services time per patient per day is 35.85 minutes (SD=35.86). A secondary objective was to analyze the impact of therapy type and administration method on pharmacist time. Figure 4 also illustrates the variation in time spent by patient category. Anti-infective patients using an ambulatory pump required the most time per day (89.39 minutes) while anti-infective patients using IV push administration required the least amount of time (22.36 minutes). While this metric provides a useful average for time spent per patient per day, actual pharmacist work is not evenly distributed and occurs at intervals throughout the patient episode of care. To illustrate this trend, pharmacist task data was analyzed and plotted by study day.

Figure 5 shows the number and category of pharmacist tasks performed each of the study days for 3 randomly selected patients. The anti-infective patient using an ambulatory infusion pump had 7 study days with 16 pharmacist tasks completed while the inotrope patient using an ambulatory infusion pump had 18 study days with 21 tasks. The anti-infective patient using the IV push administration method had 17 study days with 24 pharmacist tasks. As shown in Figure 5, the variety, and number of tasks at start of care are highest, while some

FIGURE 5 | Pharmacist Task Data for 3 Patients: Task Number & Category Per Study Day

Patient 1. Therapy Type:
Anti-infective using an ambulatory infusion pump

Study Day	1	2	3	4	5	6	7
Task Category	1	1,2,2,1,5,5,4,4	4			5,3,4	3,4,3

Patient 2. Therapy Type:
Inotrope using an ambulatory infusion pump

Study Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Task Category	5	2,5,4,4,4,1	3,5,1	4				3		5,4	4					3	5,4,4,4	4

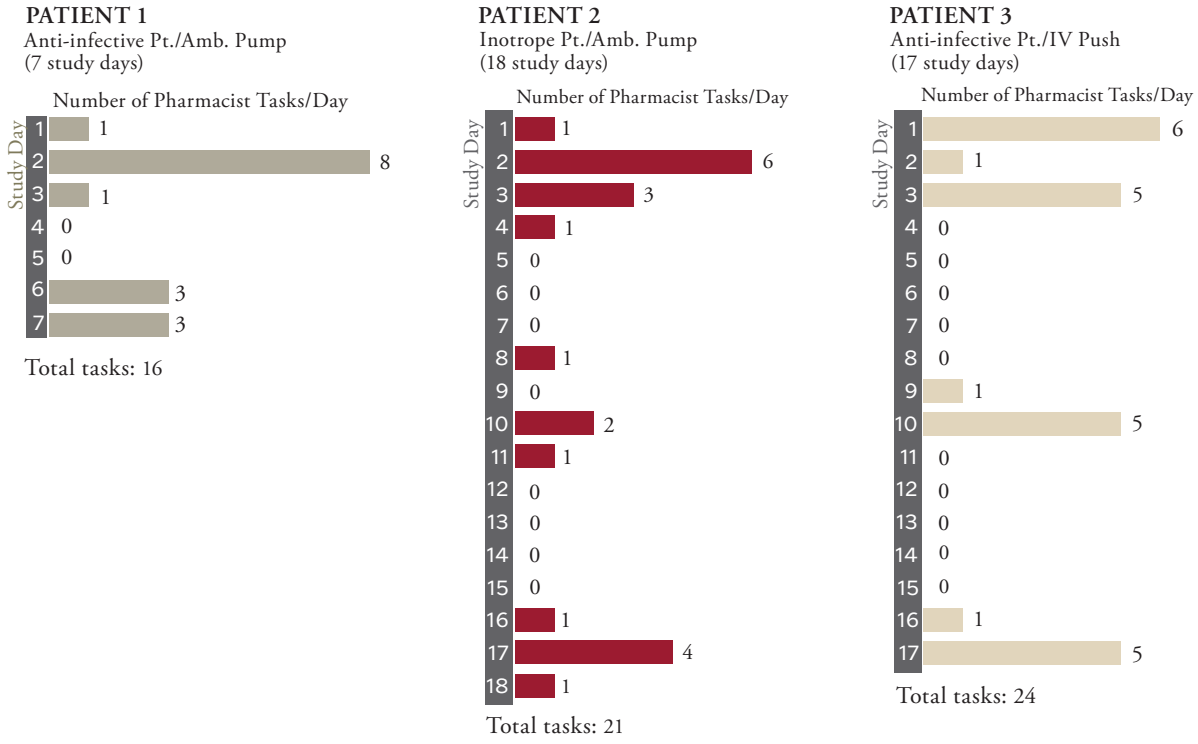
Patient 3. Therapy Type:
Anti-infective using IV Push Administration

Study Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Task Category	1,4,4,3,4,4	3	5,4,4,4,4						3	5,4,4,4,4						3	5,4,4,4,4

* Numbers are listed in order performed

Task 1 - patient assessment and documentation in EMR | **Task 2** - plan of care | **Task 3** - clinical monitoring and interventions | **Task 4** - drug prep and compounding | **Task 5** - care coordination and communication | **Task 6** - Other

FIGURE 6 | Number of Pharmacist Tasks Per Study Day: 3 Sample Patients



days do not require pharmacist time. This trend is more obvious when the data is observed in the graph shown in Figure 6.

Home Infusion Pharmacist Tasks

Pharmacist tasks were grouped into 6 categories as shown in Table 2. A total of 400 tasks were completed for the 30 patients. The data reveals that pharmacist time is nearly equally split between patient care (50.7%) and drug preparation activities (49.3%). The mean tasks per patient per day was 1.33 (SD=0.85). Anti-infective patients using an ambulatory infusion pump required the most tasks per day (2.77, SD=1.20) and anti-infective patients using IV push administration required the least (1.09, SD=0.84).

TABLE 2 | Frequency of Pharmacist Task and Percentage of Total Tasks

Task Category	Task (N)	% of Total N
1. Performing patient assessment and documentation	53	13.30%
2. Developing, implementing, and documenting care plan	29	7.20%
3. Clinical monitoring and intervention activities	36	9.00%
4. Drug preparation and compounding activities	197	49.30%
5. Care coordination and telephonic communications	81	20.30%
6. Other patient-related work tasks	4	1.00%
Total	400	100.00%

Pharmacist Time Per Task

The most time-consuming task category was patient assessments and documentation which averaged almost 41 minutes (SD=35.05) per task. Overall, the mean aggregate time per task was 22.96 minutes (SD=28.29). Drug preparation and compounding required a mean time of 25 minutes per task and comprised almost half of all tasks performed (Figures 7 and 8).

Discussion

Home infusion is associated with positive outcomes, low rates of adverse events, and high rates of patient satisfaction.[7] Of the home infusion patients (n=6,353) who responded to Patient Satisfaction Surveys in 2019 as part of an NHIF benchmarking

FIGURE 7 | Total Pharmacist Tasks Performed and Percentage by Category

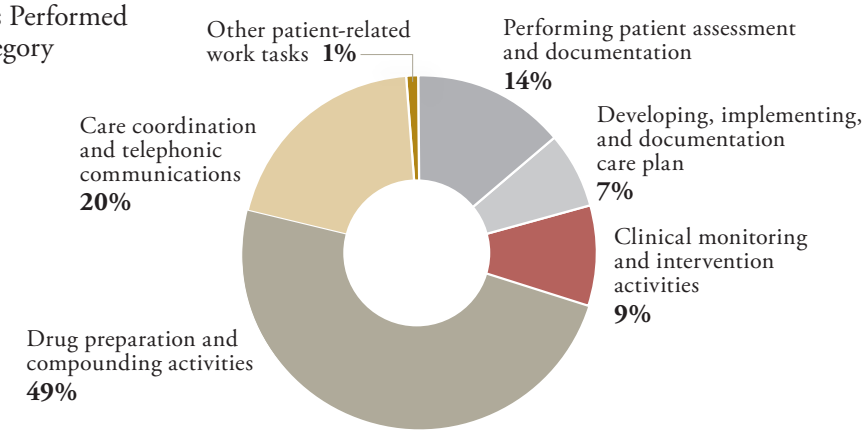


FIGURE 8 | Mean Pharmacist Time (minutes/seconds) Per Task

	Mean	SD
All tasks	22:57.3	28:29.6
Other patient-related work tasks	37:15.0	48:57.5
Care coordination and telephonic communications	11:43.7	14:30.0
Drug preparation and compounding activities	25:21.3	30:57.9
Clinical monitoring and intervention activities	08:16.7	05:49.4
Developing, implementing, and documenting care plan	21:37.2	18:48.0
Performing patient assessment and documentation	40:48.7	35:06.0

program, approximately 93% indicated that the pharmacy staff was always courteous and helpful.[8] The patient's satisfaction with the pharmacist is essential, given the amount of time pharmacists dedicate to assessing, planning, monitoring, and preparing the patient's infusion therapy.

Delivery of the home infusion service requires a multi-disciplinary clinical team of pharmacists, nurses, dietitians, physicians, and others, as well as support staff that process referrals, perform compounding tasks, manage deliveries, and submit claims for payment. The focus on the pharmacist should not diminish the contributions of the entire home infusion team, however home infusion pharmacist professional work is not well understood and therefore worthy of investigation.

Patient assessments are the most time-consuming tasks pharmacists perform, averaging slightly over 40 minutes per task. Assessments are used to document the patient's therapy is safe and appropriate for their diagnosis, and verify the home environment and caregiver support is sufficient for successful home therapy. The individual plan of care developed through the assessments, ensures proper monitoring and establishes the goals of therapy. To complete these tasks, pharmacists spend roughly 20% of their time coordinating and collaborating with patients and their health care providers.

Sterile drug preparation and compounding has grown increasingly complex over the past 2 decades; thus, it is expected that it comprises half of all pharmacists' services. Infusion pharmacists are responsible for dispensing sterile medications

that are safe, accurate, and free of contamination. Ensuring the stability and sterility of the types of home infusion medications included in this study requires expertise in evaluating drug stability studies and proficiency in sterile compounding procedures and facility operations. National standards for sterile compounding have become so complex that pharmacists with this expertise are now recognized through a Board of Pharmacy Specialties Certification designation.[10]

Therapy Type Impact on Pharmacist Time

The study demonstrates significant variability in the amount of pharmacist time spent across the different therapy categories. One interesting observation is that patients using ambulatory infusion pumps generally required more time per day than patients using the IV push method of administration. To better understand pharmacist time, the number of study days must be considered. For example, even though anti-infective patients who use an ambulatory infusion pump required the most time per day, they averaged the least number of study days (4.25) while anti-infective patients who used an IV push averaged 14.39 study days.

Review of the standard deviation, minimum, and maximum amount of time per task category shows considerable variance which is to be expected due to the wide range of complexity associated with individual patient therapy, home environment circumstances, payer mix, and acuity level. As a multi-center study, proprietary staffing models and business practices may also be a factor.

Cost of Pharmacist Services

Providers are reimbursed by commercial payers for pharmacist services as part of a bundled "per diem" that also pays for items such as IV tubing, IV catheter supplies, and pumps in addition to administrative costs. Medicare does not recognize pharmacists as health care providers and only pays for services offered by nurses in the home. As a result, the costs associated with pharmacist services are obscured and not well understood. To estimate the daily per patient salary costs for pharmacist professional services, the median annual salary ($126,110) for pharmacists from the U.S. Bureau of Labor Statistics 2018 report can be extrapolated based on the time spent per patient per day.[9] The direct salary costs (not including benefits) associated with pharmacist services for the therapy categories described in this study are estimated to be $35.17 per patient per day. This is based on the mean time spent per patient per day multiplied by the median hourly rate of $60.63. Traditional therapies such as anti-infectives, inotropes, and parenteral nutrition comprise 90.5% of all home infusion patients, therefore the cost estimate determined here is applicable to most patients receiving home infusion.[9]

Study Limitations

The study results were limited to the following types of infusion patients: anti-infectives using an ambulatory infusion pump, anti-infectives using IV push administration, inotropics using an ambulatory infusion pump, and parenteral nutrition using ambulatory infusion pump. Due to the differences observed in the therapy type data, future studies will include data from chronic therapies such as monoclonal antibodies and immune globulin. The most common limitation of this self-report time study is the potential for pharmacists to be more productive since their tasks and time were tracked. This phenomenon is noted as the Hawthorne effect and is common in self-report research.[11] Even so, self-report is commonly used to collect time utilization data. A final limitation is that the data was only collected for 2 dispensing cycles (an average of 12 days) starting with the beginning of therapy and not collected through discharge. It is not known whether the mean time per patient per day would remain consistent throughout the entire length of the therapy.

Conclusions

This home infusion pharmacist time utilization study illustrates the type of tasks and the amount of time dedicated to home infusion professional services. Pharmacists completed 400 tasks over 367 study days for the 30 patients in the study. Of the 6 categories of tasks, half (50.7%) of all pharmacist work is dedicated to patient care activities, while the remaining 49.3% involved drug preparation and compounding activities. The data shows that

pharmacists average 35.85 minutes per patient per day of professional work to provide patient care. Based on this number, the direct salary costs associated with pharmacist services for the therapy categories described in this study is estimated to be $35.17 per patient per day.

This is the first study to quantify and describe the amount and type of pharmacist professional work performed when caring for patients who infuse medications in the home setting. Time and task differences between therapy and administration methods were noted, and graphs illustrate the intensity of pharmacist services at the start and at various intervals during care. Even though patient care is highly customized, the data shows trends that can be applied to understanding a pharmacist's workflow.

Disclosures

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