



Medication Turnaround Time in the Inpatient Setting

Medication turnaround time is defined as the interval from the time a medication order is written (manually or electronically) to the time the medication was administered. Monitoring medication turnaround time in inpatient settings allows organizations to measure the impact of their health IT application on the increased efficiency of patient care.

Measure Category: Workflow impact

Quality Domain: Efficiency

Current Findings in the Literature: A potential benefit of health IT in inpatient settings is decreased medication turnaround time. Many advocate that electronic processes for medication ordering and pharmacy verification and dispensing are more efficient than paper-based systems because they may be: (1) instantly delivered to the pharmacy as opposed to manually written by the physician, delivered to the appropriate department by the clerk, transcribed to the medication administration record (MAR) by the nurse, and processed by the pharmacy; (2) easier to read as compared to copies of providers' handwriting; (3) more complete because of required fields; and/or (4) more legible to the pharmacist, reducing the need for clarification phone calls to the provider.

Hospitalized patients may experience delays in care due to delays in medication administration. Health IT that facilitates the transmission of medication data can potentially improve the quality of care by ensuring patients receive their prescribed

medications in a timelier manner. This may be most beneficial in urgent cases. For example, delays in therapeutic or prophylactic administration of antibiotics can have a major effect on patient outcomes.¹ In addition, health IT that improves medication turnaround time could help providers to better adhere to evidence-based guidelines in cases where medication administration is recommended for a given time in the patient's care.

There is a growing body of research that suggests that computerized provider order entry (CPOE), often integrated with other health IT applications, can decrease the total medication turnaround time. One hospital found a 23-percent reduction in medication turnaround time after CPOE implementation in their acute rehabilitation unit ($p=.008$).² In a study comparing two hospitals, researchers found that first doses of antibiotics were administered 56 percent faster using CPOE with clinical decision support (CDS) compared to paper based methods ($p<.001$).³

Research in specialty settings shows similar results. In a surgical intensive care unit setting (SICU) that implemented CPOE, researchers found a significant 64-percent reduction in turnaround time from order to delivery.⁴ Another study also found a 64-percent reduction ($p<0.001$) in medication turnaround time in their surgical organ transplant unit using CPOE and electronic medication administration record (eMAR).⁵ Similarly, in a neonatal intensive care setting (NICU) at a hospital that already had a pharmacy dispensing system, researchers found that medication turnaround time for very low birth weight infants receiving a loading dose of caffeine decreased by 73 percent, pre- to post-CPOE implementation.⁶



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In addition, some researchers wanted to examine the impact of health IT on specific phases in the medication order and administration process. One study, which implemented CPOE and eMAR, examined the time from order to pharmacy dispensing and from pharmacy dispensing to medication administration and found that both reductions, 86 percent and 58 percent respectively, were statistically significant.⁵ Another study found however, that when breaking down the process into two phases, (1) time from order composition to pharmacy order verification and (2) from pharmacy verification to medication administration, only the time in the first phase decreased significantly, a reduction of 61 percent.² This is most likely due to the fact that CPOE was the sole intervention, which impacts the front end of the process: increased efficiency is expected between the order to pharmacy phase, since the multiple steps required by manual medication ordering and subsequent delivery of the paper order to the pharmacy are eliminated.

Source of Data for the Measure: You could capture data for this measure in a chart review, in usage logs, or from a direct observation study (e.g., time-motion study or work sampling).

- Chart Review/Usage logs: Collect time and date information. Pre-health IT, you should use medication order records and MARs to collect the medication order and administration time data, respectively. Post-health IT, you should use CPOE usage logs to collect order time and eMARs to collect administration-time.
- Time-motion or work sampling studies: For an observational study, collect tasks, time spent on tasks, time, and date information. Time-motion or work sampling studies also may be conducted using a personal digital assistant (PDA) or Tablet. For evaluators who want more information, several resources are provided in the reference section regarding these

observation studies.^{7 10} Because it may be difficult for one observer to track the entire process, one approach may be to have one observer collect data on orders being written and have another observer collect data on nursing medication administrations.

Methodology for Measurement

Study Design: Pre- and post-health IT implementation

Study Period: Define baseline and intervention time periods (e.g., number of weeks). If you are conducting a time motion study, you will need to define observation periods (e.g., hours) as well.

Evaluation: Change in medication turnaround time, from the time the medication was ordered to the time of administration, pre- to post-health IT implementation.

Analysis Considerations

Several issues should be addressed before proceeding with an analysis plan:

1. You may need to adjust for patient care unit, severity of illness, time-of-day, or patient volume to account for possible confounding. You also need to consider the type of medication order placed (routine versus stat versus recurring) and stratify your results by these categories. For example, a medication administered on a recurring basis may have an order placed several days ago; if this is not considered, there will be a long interval between time of order and time of administration, but this is not due to a delay.



2. If you choose to do manual chart and medication record reviews, you may have to consider a sample of medication orders due to the resources required for paper chart reviews. (For guidance on sampling, please see the Health IT Evaluation Toolkit¹¹). Some experts caution against relying on chart reviews because of possible inaccurate time and date recording by clinicians.
3. Your data collection and analysis plan should be based on sound methodology. To achieve valid, robust results, consider planning your analysis with the input of a trained statistician to determine sample size and appropriate statistical techniques. It is not uncommon to begin analyzing data, only to find the original statistical plan was flawed, leaving you with data that is inadequate for analysis.
4. If you choose to conduct an observational study, before you build a data collection tool, observe and document all tasks of the clinicians involved in the medication ordering, dispensing, and administration process to comprehensively capture each potential task. Time-motion data collection instruments are available for public use on the AHRQ NRC Health IT Web site.¹² Although these instruments are specific to provider workflow in ambulatory settings and to nursing workflow using bar-coding, evaluators may be able to leverage and modify this existing work for use in their own observational study.
5. A pilot is recommended to ensure that observers understand the definitions of tasks accurately and that there is consistency between observers. In addition, observers should be trained properly on conducting the observational study chosen.

Relative Cost: Low: if the medical records department or pharmacy are already collecting order

data. High: if conducting a manual chart review, time-motion study, or work sampling; or if medication administration records need to be reviewed. Study cost could be high to hire and train qualified observers. Nonclinical observers, including college students, may be used if adequately trained regarding clinical tasks nurses. However, without a clinical background, observers cannot be expected to recognize all aspects of clinical work or the nature of the tasks clinicians perform, demonstrating the need to clearly define the tasks to be documented in advance.

Potential Risks: Confounding based on type of order. If conducting a time-motion study, observers need to understand basic provider workflow and their processes.

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