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Improving Patient Flow in an Outpatient Infusion Center

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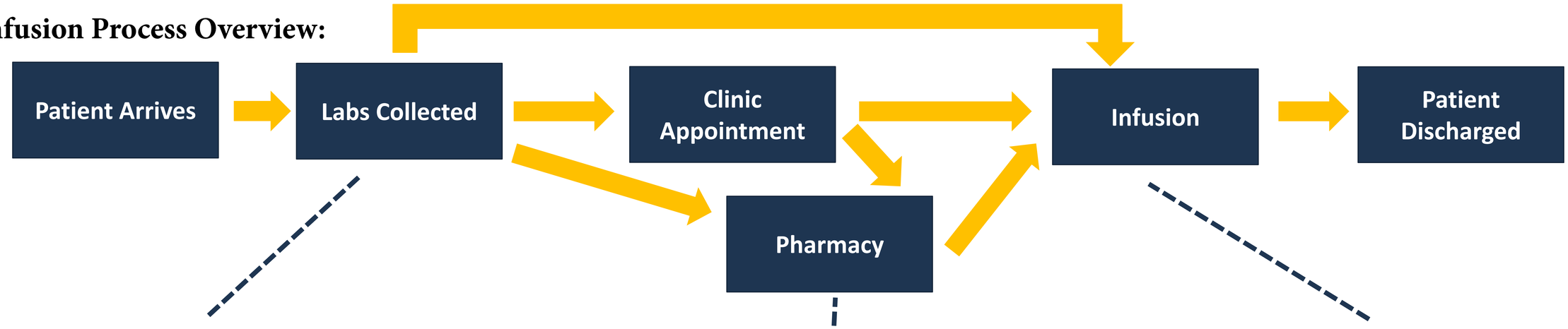
Infusion Process Overview:



Lab Process Analysis

Background:

- Lab results need to be available before a provider can assess a patient in clinic, the pharmacy can begin drug preparation for infusion patients, and nurses can administer infusions to patients

Methods:

- Mapped process from patient arrival to lab resulted for three common infusion labs (CBCD, CMP, Type and Screen)
- Explored idea of uncoupling patient visits meaning labs would be done the day before an appointment

Findings:

- Each of the three labs' average processing times exceeded the one hour target turnaround time used for scheduling
- Patient travel time results:

Driving Duration	Percent of Patients to Closest Lab Facility
Less than 15 min	32%
15 – 30 min	20%
30 – 60 min	23%
1 – 2 hours	15%
2 – 4 hours	7%
Over 4 hours	3%

- Potential for uncoupling lab visits exists for those patients within close proximity to a lab facility

Pharmacy Pre-mix Tool

Background:

- Pharmacy often does not prepare a patient's drug in advance due to the expensive, toxic, and unstable nature of many chemotherapy drugs
- Prepping additional drugs in advance can reduce patient wait times and level pharmacy's workload

Methods:

- Identifying additional drugs to be prepared during make ahead time and creating formulation to rank drugs in order to be mixed

Input	Effect on Priority
Drug cost	Low cost → Higher priority
Probability of deferral or dosage change	Low probability → Higher priority
Number of patients receiving drug	Higher number of patients → Higher priority
Drug shelf life (hang by/expiration)	Long shelf life → Higher priority
Drug compounding time	Possibly short compounding time → Higher priority
Appointment time	Early appointment time → Higher priority
Length of infusion	Long infusion → Higher priority

Infusion Scheduling

Background:

- Chemotherapy treatment demands often exceeds ambulatory infusion capacity
- Currently patients wait on average 45 minutes from arrival in infusion until they are seated in an infusion chair
- Improved scheduling of infusion patients can lead to improved utilization of infusion resources resulting in reduced total length of day of operations and patient wait time

Methods:

- Used stochastic optimization to generate infusion patient appointment schedules which were evaluated through a discrete event simulation model
- Optimization Model:

  Minimize:

  Trade-off between expected patient wait time and expected overtime

  Subject to:

  Patients are assigned to a time and a chair

  Patients wait until a nurse and a chair are available

  The day ends when the last patient is discharged

Findings:

- Scheduling patients with longer infusion times earlier in the day results in reduced total length of day operations and patient wait time

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