



Hospital B: IV pump Availability **Evolution of a Process Improvement Initiative**

Problem: Shortage of IV pumps in 550 bed hospital having an average of 19,000 inpatient admissions/year, a total of 45,000 bed days per year, and ALOS 3.5 days.

Historical Data 2004-2005:

- ❖ In January 2004, there were a total of 318 new IV pumps in inventory based on recent purchases. [By January 2005, however, only 235 of the 318 (74%) IV pumps could be accounted for.]
- ❖ As a result of the shortage of IV pumps the reported number of IV medication administration delays >15 minutes in 2004 increased from 0% of patient admissions in the first quarter to 5% of patient admissions (238 pts.) in the second quarter, to 9% of patient admissions (428 pts.) in the 3rd quarter, and to 15% of patient admissions (712 pts.) by the 4th quarter. This was despite the fact that the volume of IV medication orders had remained fairly constant over the four quarters, averaging a total of 200,000 IV medication doses each quarter.
- ❖ Root cause analysis of the IV medication administration process revealed that the primary cause of delays was inability of nursing staff to locate an IV pump within 15 minutes of the time an initial dose of IV medication was ordered. In the majority of cases (>70%), the delay in obtaining an IV pump ranged between 20-30 minutes.
- ❖ As the number of IV medication administration delays rose there was a proportionate increase in patient complaints associated with high pain scores, physician complaints associated with adverse clinical outcomes, and nursing complaints associated with adverse clinical events, physician and patient dissatisfaction, and interruption of work flow.



Analysis of the Consequences of IV Pump Shortage on Clinical Outcomes:

Analysis of the impact of these delays in IV medication administration revealed the following outcomes:

- Hypotensive emergency resulting in cardiac arrest-3 cases
Death ascribable to delay: 1 case
- Delayed management of shock-45 cases
Death ascribable to delay: 2 cases
Cerebral injury ascribable to delay: 3 cases
- Cancellation/24 hour delay in scheduled surgery-3 cases
- Pain score >8/10 resulting in failure to meet JCAHO standards for assessment and treatment of pain -982 patients/14,105 patients prescribed IV analgesia (7%)
- Delay in pump access resulted in failure to timely administer antibiotics in patients with a diagnosis of pneumonia resulting in failure to meet JCAHO ORYX indicator -47/ 385 pneumonia patients (12.2% failure rate)
- Decline in satisfaction scores for 2004 attributable to delays in obtaining IV pumps:
Patients: 20% drop in scores
Nurses: 35% drop in scores
Materials management: 40% drop in scores
Physicians: 30% drop in scores

2004 Performance Improvement Initiatives:

Because of the increasing occurrences of IV pump shortages, adverse patient outcomes, and significant compliance issues with JCAHO initiatives, and mounting patient, employee and physician dissatisfaction, Hospital's Performance Improvement Committee established a house-wide initiative in January 2005 which was coordinated by the Materials Management Department to locate and numerically all IV pumps. Only 85% of the original IV pump inventory of 318 IV pumps were recovered. The location of 48 IV pumps could not be determined.



It was speculated that the loss of IV pumps could be attributed to the following causes:

- Transfer to other hospitals including long-term care and skilled nursing facilities
- Patients leaving with IV pumps who require outpatient chemotherapy and home health
- Theft, vandalism
- Unidentified misplacement

2004 Cost/Risk Analysis:

To offset the IV pump deficit, and anticipate further losses, the Materials Management Department requisitioned for the purchase of 80 new IV pumps. Each pump costs \$3,450.00. By January 31, 2005, there were now a total of 315 IV pumps in the hospital.

Total expenditure on new IV pumps was \$276,000.

6 lawsuits with delay in treatment of hypotension/shock:

Settlements (3 cases) totaling \$ 2,500,000
Jury verdict (1 case) totaling \$ 3,000,000
Pending trial (2 cases)

Department of Health Investigation (2 of above cases):

Investigation revealed a quality issue and requirement for corrective action plan.

JCAHO Accreditation:

Type I Score for pain management requiring a corrective action plan

Low ORYX score for timely antibiotic administration resulted in increase in ALOS from 4.5 days to 6.5 days for patients with a diagnosis of pneumonia.

Cost of 2 more days hospitalization \$376,000



Non-Productive use of Human Resources:

On an average, it was estimated that 30 minutes of both nurse FTE and materials management FTE time was spent locating an IV pump for each case where a delay was recorded.

The estimated cost of non-productive FTE hours was estimated at \$ 27,560.00

Total realized costs: \$6,179,560

Unrealized cost potential: \$5,500,000 (two cases pending trial)

Historical Data: 1st-2nd Quarter YTD 2005

- ❖ By January 31, 2005, there were 315 IV pumps accounted for hospital-wide as a result of locating 235 IV pumps and purchasing 80 new IV pumps.
- ❖ As a result of the increase in IV pumps, IV medication administration delays fell sharply from 15% of patient admissions (712 pts) in the 4th quarter 2004 to only 3% of patient admissions (142 pts.). This was attributed to the performance improvement initiative designed to locate and numerically tag all IV poles hospital-wide, in addition to the purchase of 80 additional IV poles. Data for the second month of the first quarter 2005 were most influenced by these PI initiatives.
- ❖ In the second quarter 2005, however, the number of IV medication administration delays began to rise again from 3% of patient admissions (142 pts.) in the first quarter 2005 to 10% of patient admissions (475 pts.) in the second quarter 2005. Anticipating that the problem would only continue to get worse, the PI Committee again performed a root cause analysis.
- ❖ Root cause analysis of the IV medication administration process again revealed that the primary cause of delays was inability of nursing staff to locate an IV pump at the time an initial dose of IV medication was ordered.



- ❖ As the number of IV medication administration delays rose there again was a proportionate increase in patient complaints associated with high pain scores, physician complaints associated with adverse clinical outcomes, and nursing complaints associated with adverse clinical events, physician and patient dissatisfaction, and interruption of work flow.

1st-2nd Quarter 2005 Analysis of the Consequences of IV Pump Shortage on Clinical Outcomes:

Analysis of the impact of these delays in IV medication administration revealed the following outcomes:

- Hypotensive emergency resulting in cardiac arrest-2 cases
Death ascribable to delay: 1 case
- Delayed management of shock-15 cases
Death ascribable to delay: 1 case
Cerebral injury ascribable to delay: 1 case
- Cancellation/24 hour delay in scheduled surgery-2 cases
- Pain score >8/10 resulting in failure to meet JCAHO standards for assessment and treatment of pain -335patients/7,500 patients prescribed IV analgesia (4.5%)
- Delay in pump access resulted in failure to timely administer antibiotics in patients with a diagnosis of pneumonia resulting in failure to meet JCAHO ORYX indicator -22/ 185 pneumonia patients (11.9% failure rate). ALOS was 6 days (1.5 days above target).
-

Post 2nd Quarter 2005 Performance Improvement Initiatives:

The PI Committee recognized that the 2004 performance improvement initiatives designed to reduce delays in obtaining IV pumps for medication administration was clearly unsuccessful. For the first six months of 2005, despite the purchase of 80 new IV pumps, there were noted increases in delays there continued to be adverse consequences of IV pump shortages on clinical outcomes. Nursing staff, physicians, and patients continued to cite their frustrations with IV pump shortages in the results of quarterly satisfaction surveys obtained by the hospital.



Recommendation/Strategy:

The PI Committee was assigned by the Hospital's Steering Committee to design processes which could prevent continued losses, including regulatory and liability exposure. Thus, the PI Committee looked to technology to solve the problem. Many different types of asset tracking systems were evaluated. All were capable of real-time tracking of tagged assets. However, they chose the SeeKlinger™ Asset Tracking System because it could be integrated into the hospital's information system to produce reliable analytical, up-to date performance data.

With the implementation of the SeeKlinger™ Asset Tracking System, a “zero defects” rule was set for IV medication administration delays due to obtaining IV pumps.

3rd-4th Quarter 2005 Results [Post Implementation SeeKlinger™]:

The number of RFID tagged IV pumps totaled 298, a loss of 17 pumps in the first half of 2005 since 80 new pumps were purchased. Since implementation of the SeeKlinger™ Asset Tracking System 3rd-4th Quarter 2005 tagged asset analysis data have revealed interesting results:

- ❖ All IV pumps continue to be accounted for in-house. There have been zero actual losses.
- ❖ Potential losses of IV pumps have occurred in fifteen (15) cases for the following reasons. All were prevented:

9 patients transferred by EMS to another facility. 6 patients planned to leave with their IV pumps in anticipation of outpatient chemotherapy. SeeKlinger™ Asset Tracking System helped prevent loss of these IV pumps since movement of these pumps outside the hospital triggered an alarm in the Materials Management Dept. Staff in the Materials Management Department were able to identify the location of the IV pole. Simultaneous to this initiative, the Hospital had implemented ProLocator™ and PatientLocator™ which track the movement of staff and patients throughout the hospital. Use of ProLocator™ helped identify staff who would require further inservicing on loss prevention.



IV Pumps: Impact of Lost Assets on Delays in Patient Care and Outcomes

Measurement	2004	1 st -2 nd Quarter 2005	3 rd -4 th Quarter 2005
# IV pumps	318 pumps	315 pumps	298 pumps
# IV pumps lost	83 pumps		17 pumps
# pumps purchased		80 pumps	0 pumps
# delays in obtaining an IV pump resulting in >15 minutes delay in IV medication administration	1375 patients (13.8% of all admissions)		0 delays
Liability Impact	Realized: \$6,179,560 Unrealized [based on historical jury verdicts-2 cases]: \$5,500,000	Realized: \$280,000 [80 new pumps] Unrealized: [based on historical jury verdicts-3 cases]: \$8,500,000	Realized: \$0 Unrealized: \$0
Bed Utilization/Cost Impact	2 day increase from 4.5 day target ALOS pneumonia patients Cost: \$376,000	1.5 day increase from 4.5 day target ALOS pneumonia patients Cost: \$282,000	ALOS to target of 4.5 days
Regulatory Agency Impact	JCAHO pain management standard: 7% failure rate due to IV pump delay Result: Type I recommendation. Corrective action plan JCAHO: ORYX-12.2% failure rate for timely antibiotic administration-pneumonia (2) Dept. of Health Complaints	JCAHO pain management standard: 4.5% failure rate due to IV pump delay Result: Corrective action plan unsuccessful. JCAHO: ORYX-11.9% failure rate for timely antibiotic administration-pneumonia	JCAHO pain management standard: 0% failure due to IV pump delay Result: Corrective action plan successful. JCAHO ORYX-0% delays due to IV pump shortage
Customer Satisfaction	Drop in scores: Patients: 20% Nurses: 35% drop in scores Materials management: 40% Physicians: 30%	No change compared to 2004 data	Improved scores: Patients: 18% Nurses: 30% Materials management: 40% Physicians: 27%