The Role and Value of ED Pharmacy Services

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Grady Health System
SCSHP 2010 Annual Meeting

Objectives
- Describe clinical challenges in the emergency department (ED)
- Describe literature in support of emergency medicine (EM) pharmacy services
- Describe the role of the pharmacist in the ED
- List challenges facing EM pharmacy services

Clinical challenges in the emergency department

Error-Producing Conditions
- Providers focused on stabilization (ABC’s)
- Safety mechanisms not in place
  - Verbal orders
  - High stress situations
- Lack of information
  - Limited patient data

Challenges to Patient Care
- Boarding of admitted patients
- Multiple patients treated simultaneously
- On-call physician shortage
- ED visits up 26%
- Wide range of medications used

Nursing Shortages

<table>
<thead>
<tr>
<th>Area</th>
<th>Nurse:Patient Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floor</td>
<td>1:4-5</td>
</tr>
<tr>
<td>ICU</td>
<td>1:2</td>
</tr>
<tr>
<td>ED</td>
<td>1:7-12</td>
</tr>
</tbody>
</table>

GHS survey
http://www.aacn.nche.edu

http://www.acep.org/advocacy.aspx?id=21870
http://www.cdc.gov/nchs/data/ad/ad358.pdf

GHS = Grady Health System
Pharmacy Workflow

Order Written

- RN goes to Zone Pyxis and gets med
- RN scans order to pharmacy
- ED tech goes to pharmacy to get med

Pharmacist processes order

Med in Pyxis:
Med released in Profile Pyxis

Med not in Pyxis:
Med prepared and tube up to ED

Issues
- What is in Pyxis?
- When to access Pyxis?

Issues
- Med lost/misplaced
- Reissue

Pharmacist processes order

Go to pharmacy satellite from 8a to 1 am

Med in Pyxis:
Med released in Profile Pyxis

Med not in Pyxis:
Med prepared and tube up to ED

Issues
- What is in Pyxis?
- When to access Pyxis?

Issues
- Med lost/misplaced
- Reissue

Hazardous Environment

- Transition of care point
- Patients present as strangers
- Multiple patients treated simultaneously
- Interruptions & distractions
- Time constraints
- Wide range of medications used

Medication Errors

- High-risk environment
  - Verbal orders
- High-risk medications
  - Intravenous route
- Transitional staffing
  - High turn-over
  - Shift work
  - Lack of experienced providers

Medication Errors in the ED

- More than 75% ED visits associated with medication administration or prescribing
  >210 million medication encounters annually
- Higher prevalence of preventable adverse events
  - Elderly patients (N=898)
    - 3.6% in the ED
    - 5.6% upon discharge

MEDMARX ED Med Errors

- 13,932 errors from 496 ED
  - 78 per 100,000 visits
- Characteristics
  - Administration phase
  - Improper dose
  - Failure to follow procedures
Literature in support of emergency medicine pharmacy services

The Clinical Pharmacist in Emergency Medicine

- 14-item questionnaire (n=54)
- Benefit to patient care
  - Majority of MD and RN
- Recommendations followed
  - Always
  - Most of the time
- Transferable to other ED

Elenbaas RM. AJHP 1977;34(8):843-6

ICU Success with Dedicated Pharmacist

- Pharmacist on medical rounds reduced the risk of ADE’s
- 99% of pharmacist recommendations to medical staff were well accepted
- Existing pharmacist participated in rounds
- Required no additional resources
  - Different use of existing pharmacists’ time


Emergency Pharmacist (Eph) Improves TJC Compliance

- High-yield medication orders are reviewed
- The effects of medication(s) on patients are monitored
- High degree of communication with nurses and physicians [1]
- Hospital develops processes for managing high risk/high alert medications [2]


Valued Staff Member

- It has been shown that staff value the EPh
  - 26 item survey to random ED staff with 82% responding.
  - 99% felt EPh improves quality of care.
  - 96% felt EPh was an integral part of ED team.
  - 95% indicated they had consulted with EPh at least a few times during last 5 shifts.


Clinical and Cost-Saving Pharmacy Intervention In The Emergency Room: A Four Month Study

<table>
<thead>
<tr>
<th>Type of Intervention</th>
<th>No. Interventions</th>
<th>Average Cost Avoidance per Intervention ($)</th>
<th>Cost Avoidance ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug-drug or drug Disease interactions or drug incompatibilities identified</td>
<td>334</td>
<td>1,647</td>
<td>297,053</td>
</tr>
<tr>
<td>Therapeutic recommendation</td>
<td>523</td>
<td>1,188</td>
<td>273,383</td>
</tr>
<tr>
<td>Adverse drug event prevented</td>
<td>48</td>
<td>1,098</td>
<td>23,190</td>
</tr>
<tr>
<td>Medication error prevented</td>
<td>488</td>
<td>1,375</td>
<td>436,150</td>
</tr>
<tr>
<td>Total</td>
<td>1393</td>
<td>5,308</td>
<td>1,029,776</td>
</tr>
</tbody>
</table>

Lada P et al. Am J Health Syst Pharm. 2007;64(14):63-8
Documentation of Pharmacist Interventions In The Emergency Department

JM Ling, LA Mike, J Rubin, P Abraham, A Howe, J Patka, D Vigliotti

Am J Health-Syst Pharm. 2005; 62:1793-7

Top 10 Interventions (N=360)

- Formulary preferred agent: 63
- Subtherapeutic dose/frequency: 49
- Supratherapeutic dose/frequency: 48
- Professional services: 33
- Allergy documentation: 25
- Improper drug selection: 19
- Drug information (oral/written): 14
- Drug information (oral): 12
- Untreated indication: 11
- Therapeutic duplication: 11

Top 10 Drugs (N=360)

- levofloxacin: 17
- azithromycin: 12
- midazolam: 12
- piperacillin-tazobactam: 11
- doxycycline: 11
- vancomycin: 10
- propofol: 8
- co-trimoxazole: 8
- ceftriaxone: 8
- pantoprazole: 7

Events Avoided (N=360)

- Prescriber knowledge deficit: 5%
- Medication error: 3%
- Drug cost avoidance: 21%
- Adverse drug reaction: 29%
- Sub-optimal disease management: 42%

Cost-Avoidance (N=360)

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
<th>Cost-avoided</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug information</td>
<td>9%</td>
<td>$701</td>
</tr>
<tr>
<td>Drug cost-avoidance</td>
<td>31%</td>
<td>$3,354</td>
</tr>
<tr>
<td>Avoidance of additional treatment</td>
<td>60%</td>
<td>$188,868</td>
</tr>
<tr>
<td>Total cost-avoidance</td>
<td></td>
<td>$192,923</td>
</tr>
</tbody>
</table>

Annual Projected savings of about $600,000

The EPh – A Safe Measure In Emergency Medicine

- Presence in the ED improves process measures
  - Time to cath lab, abx in pneumonia, pain management, etc [1]
- Ensures a needed layer of safety in a vulnerable ED environment [2]
- Is a cost saving benefit to the ED [3]

Data Collected

- **Cumulative Data:**
  - 227 observation periods
  - 791 hours at 4 EDs
  - Pharmacists reviewed 17,320 medications that were ordered or administered
  - 6,471 patients affected

- **Mean Data per Observation Period:**
  - Number of medications = 76.6
  - Number of patients = 28.6
  - Observation duration: 3.5 hour

Types of Recovered Errors

<table>
<thead>
<tr>
<th>Type of ME</th>
<th>n (%)</th>
<th>Examples of the Most Frequently Recovered Medication Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under dose</td>
<td>94 (16.6)</td>
<td>Order received for a loading dose of 1400 mg acetylcysteine for a 100 kg pt. with an acetaminophen overdose. The RPh corrected the dose to 14000 mg.</td>
</tr>
<tr>
<td>Over-dose</td>
<td>87 (13.8)</td>
<td>Order received for a heparin infusion rate at 500 units/hour but was transcribed by the nurse as 500 units/kg/hour. The RPh corrected the error.</td>
</tr>
<tr>
<td>Drug Omission</td>
<td>59 (10.5)</td>
<td>Order received for Ca gluconate, Kayexalate and insulin to treat severe hyperkalemia. The RPh noticed the blood glucose of 100 mg/dl and recommended adding 50 gms IV dextrose.</td>
</tr>
<tr>
<td>Wrong Drug</td>
<td>35 (6.8)</td>
<td>Order received for succinylcholine for RSI of a patient with a K+ of 8.3. The RPh recommended changing to rocuronium.</td>
</tr>
</tbody>
</table>

Characteristics of Study Emergency Departments

<table>
<thead>
<tr>
<th>Site</th>
<th>Hospital A</th>
<th>Hospital B</th>
<th>Hospital C</th>
<th>Hospital D</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACU beds</td>
<td>47</td>
<td>59</td>
<td>64</td>
<td>45</td>
</tr>
<tr>
<td>Pediatric patients</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Observation unit in ED</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Trauma designation</td>
<td>Level 1</td>
<td>Level 1</td>
<td>Level 1</td>
<td>Level 1</td>
</tr>
<tr>
<td>Emergency medicine residency program</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>ED Computerized Physician Order Entry</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>ED pharmacist coverage – total hours per week</td>
<td>112</td>
<td>97</td>
<td>77</td>
<td>158</td>
</tr>
<tr>
<td>ED pharmacist coverage by day and time</td>
<td>Mon-Sat: 8AM - 11PM, Sat-Sun: 1:30PM - 12MN</td>
<td>Mon-Sat: 7AM - 11PM, Sat-Sun: 1:30PM - 10PM</td>
<td>Mon-Sat: 8AM - 1AM, Sat-Sun: 3PM - 1AM</td>
<td>24/7</td>
</tr>
</tbody>
</table>

Observations and Recovered Errors

<table>
<thead>
<tr>
<th>Hospital Site</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medications reviewed by RPh</td>
<td>3404</td>
<td>3702</td>
<td>3496</td>
<td>6718</td>
<td>17329</td>
</tr>
<tr>
<td>Medications reviewed per session</td>
<td>56.7</td>
<td>75.6</td>
<td>54.6</td>
<td>126.8</td>
<td>76.6</td>
</tr>
<tr>
<td>Recovered MEs</td>
<td>148</td>
<td>80</td>
<td>110</td>
<td>169</td>
<td>505</td>
</tr>
<tr>
<td>Recovered MEs per 100 pts</td>
<td>6.2</td>
<td>8.2</td>
<td>9.6</td>
<td>8.5</td>
<td>7.8 (6.2 – 9.6)</td>
</tr>
<tr>
<td>Recovered MEs per 100 meds</td>
<td>4.29</td>
<td>2.16</td>
<td>3.15</td>
<td>2.52</td>
<td>2.92 (2.16 – 4.29)</td>
</tr>
</tbody>
</table>

Summary of Results (1)

- **ED RPhs Interventions:**
  - 25.7 potentially harmful MEs (mean) per 40 hours of observation
  - 48% judged potentially serious
  - 36% significant
  - 4.4% judged life-threatening
  - 96.8% of ED Pharmacist recommendations were accepted
Summary of Results (2)

- Status of Recovered Potentially Harmful ADEs:
  - Intercepted 90.3%
  - Mitigated 3.9%
  - Ameliorated 0.2%

- Most Common Medications Intervened on:
  - Antimicrobials 32%
  - CNS agents 16%
  - Anticoagulant/lytics 14%

Conclusions

- ED Pharmacists commonly recover and prevent potentially harmful MEs and improve patient safety
- ED pharmacists play a critical role in improving the quality of patient care by improving drug treatment regimes
- Controlled trials are necessary
  - Net cost-benefit, safety, quality and costs
  - This is an especially important consideration for smaller emergency and pharmacy departments.

Role of the pharmacist in the emergency department

ED Clinical Pharmacy Services

<table>
<thead>
<tr>
<th>Clinical Service</th>
<th>Hospital with Dedicated ED Pharmacist (n = 17)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medication error or adverse drug reaction reporting</td>
<td>14 (82.4)</td>
</tr>
<tr>
<td>Order clarification</td>
<td>13 (76.5)</td>
</tr>
<tr>
<td>Drug or lab results information</td>
<td>14 (82.4)</td>
</tr>
<tr>
<td>Formulary adjustment</td>
<td>13 (76.5)</td>
</tr>
<tr>
<td>Cardiac emergency medication participation</td>
<td>15 (88.2)</td>
</tr>
<tr>
<td>Allergen screening</td>
<td>11 (64.7)</td>
</tr>
<tr>
<td>ED receive medical records</td>
<td>11 (64.7)</td>
</tr>
<tr>
<td>Drug interactions concerning</td>
<td>11 (64.7)</td>
</tr>
<tr>
<td>Anticoagulant decline</td>
<td>16 (94.1)</td>
</tr>
<tr>
<td>Overdose review</td>
<td>16 (94.1)</td>
</tr>
<tr>
<td>Mental status</td>
<td>16 (94.1)</td>
</tr>
<tr>
<td>Nursing therapy recommendations</td>
<td>12 (70.6)</td>
</tr>
<tr>
<td>Pharmacokinetic dosing</td>
<td>9 (52.9)</td>
</tr>
<tr>
<td>Patient education and counseling</td>
<td>13 (76.5)</td>
</tr>
<tr>
<td>Research activities</td>
<td>1 (6.0)</td>
</tr>
<tr>
<td>Accommodation of patient instructions, etc.</td>
<td>11 (64.7)</td>
</tr>
<tr>
<td>Genealogy or mentorship for students and residents</td>
<td>5 (29.4)</td>
</tr>
<tr>
<td>Medication Reconciliation</td>
<td>7 (41.2)</td>
</tr>
<tr>
<td>Other</td>
<td>1 (6.0)</td>
</tr>
</tbody>
</table>

Pioneers of ED Pharmacy

- Purely clinical
  - Academic faculty
  - Research
  - Teaching
- Toxicology
- Trailblazers

ED Job Duties

- Emergency response
- Education
- Distributive
- Clinical
Emergency Response

- Participate in code response, trauma resuscitation, thrombolytic administration
- Titration of critical medications
- Facilitate drug procurement

Education

- Physicians
- Nursing
- Patients
  - Discharge counseling
  - Smoking cessation
  - Heart failure

Distribution

- Immediately review high risk medication orders
  - Pediatric orders < 1 year of age and/or less than 10 kg
- Provides immediate accessibility to healthcare team
- USP 797 standards

Clinical

- Formulary management
  - Consults with MD
- Renal dosing
- Antibiotic recommendations
  - MRSA
  - Resistance
- Pathway development

Emergencypharmacist.org
Challenges facing emergency medicine pharmacy services

ED Crowding
- Once every minute an ambulance is diverted from an ED that is full to one farther away


Evolving Roles
- Clinical
- Distributive
- PGY-2 residencies

TJC standards
- Medication review
  - Standard MM.4.10
- Med reconciliation
  - National patient safety goal 8
- Core measures
  - Pneumonia, MI, HF, EGDT

Healthcare Economics
- Increasing costs
- Healthcare consultants
- Clinical cost avoidance may be considered soft

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