Adverse Drug Events: A Focus on Anticoagulation

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Fairview Health Services

- 6 hospitals, ranging from rural to academic
- 50+ primary care clinics
- Home care/hospice, home infusion, long term care, retail pharmacy, PBM
- 20,000 employees, 3,000 physicians
- 73,000 annual admissions; 175,000 ED visits; 1 million clinic visits
- $3 billion gross revenue
- > 8,000,000 annual inpatient doses dispensed
- 1.7 million annual retail pharmacy prescriptions
Disclaimer
What is medication safety?
What is medication safety?

- Absence of errors
- Absence of adverse events as measured by______?
- Absence of preventable adverse events
- Absence of reportable events
- Adherence to guidelines/standards
- Adherence to NPSG
- Positive cultural surveys
- Good responses to self-assessment surveys (ISMP, Leapfrog)?
What is safety?

- Safety is a condition defined by the perception of the customer (patient).

- Safety is not synonymous with the absence of risk or adverse events. Instead it is marked by the knowledge and comfort that all efforts are being made to prevent everything we know how to prevent and that we are striving to make things even better.
  - Aviation, automobile, nuclear power

- Error reduction, adherence to guidelines, etc are tactics, not strategies
Harm vs. Error

Preventable Adverse Events

Potential Adverse Events

Adverse Drug Events

Medication Errors
Fairview’s ADE Measurement System

• 100% real-time review of triggers for harm from high hazard drugs:
  • Naloxone use (narcotics)
  • Flumazenil use (sedatives)
  • Blood sugar $\leq 40$ mg/dl (antidiabetic agents)
  • INR $> 5$ (warfarin)*
  • PTT $> 200$; anti-Xa level $> 1.6$ (heparin)
  • prothrombin complex concentrate and coagulation factor VIIa (rivaroxaban and dabigatran)

*Threshold of 6 until 2Q 2012
Anticoagulation Review Criteria

• A “legitimate” screen.
  • Example: a bedside PTT reading of 215 seconds but a subsequent laboratory analysis was 135 seconds.
  • In these cases, the record is coded as “artifact” and no further action would be taken.

• If the screen is determined to be legitimate, was it associated with an anti-coagulant? Example:
  • An INR of 7 relating to liver disease or malnutrition.
  • In these cases, the record is coded as “no adverse drug event”.
Anticoagulation Review Criteria

- If the high INR or PTT or antidote was associated with the use of an anticoagulant and there was clinical intervention, an ADE has occurred.
  - Simply modifying or holding the dose is NOT a clinical intervention
  - The use of an antidote automatically mean that an adverse event occurred. Exception: planned reversals such as prior to surgery
- Warfarin-related bleeding resulting from outpatient services do NOT count as an ADE it is related to a prior hospital discharge.
## Anticoagulation Harm Ratings

<table>
<thead>
<tr>
<th>Harm Category</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>An event contributed to or resulted in temporary harm to the patient</td>
<td>Reversal was successful with no further action warranted. Reversal was successful but recovery was complicated by comorbid medical conditions. Additional assistance from medical or nursing staff needed, such as the rapid response team.</td>
</tr>
<tr>
<td>F</td>
<td>An event contributed to or resulted in temporary harm to the patients and prolonged hospitalization</td>
<td>Prolonged or repeated treatment with protamine, fresh frozen plasma, or vitamin K. Transfer to an ICU Use of argatroban due to heparin-induced thrombocytopenia Readmission</td>
</tr>
<tr>
<td>G</td>
<td>An event contributed to or resulted in permanent patient harm</td>
<td>Permanent injury or disability, such as a myocardial infarction, resulting from hemorrhage.</td>
</tr>
<tr>
<td>H</td>
<td>An event which required intervention to sustain life</td>
<td>Event resulted in Code Blue.</td>
</tr>
<tr>
<td>I</td>
<td>An event which contributed to the patient’s death</td>
<td>Death resulting from prolonged hemorrhage or a secondary medical condition, such as acute MI, that was related to the hemorrhage.</td>
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ADE Gap Analysis
Anticoagulants

Courtesy of the Minnesota Hospital Association
Hospital Engagement Network
1. Antithrombotic management practices

1a) Responsibility is assigned for coordinating anticoagulation monitoring functions.

A process exists to ensure fields contained in standard protocols/order sets/flowsheets are consistently populated (manually or automatically) with key information, including at a minimum:

1b) The patient’s diagnosis

1c) Allergies

1d) Most recent pertinent laboratory results
1. Antithrombotic management practices

Standard policies & practices exist for managing the initiation and maintenance of anticoagulation therapy which include:

1e) The specific medication used (e.g., low molecular weight heparin (LMWH), warfarin, unfractionated heparin (UFH), Vitamin K reversal, direct thrombin inhibitors)

1f) The condition being treated

1g) The potential for drug interactions
1. Antithrombotic management practices

1h) A protocol exists to determine the need to reverse supra-therapeutic INR values based on key criteria, (e.g., the INR value, the presence or absence of bleeding, individual patient situation, e.g., imminent surgery).

1i) A process exists to ensure that anti-platelet agents are used for the appropriate indication (e.g., patients with mechanical valves, acute coronary syndrome or recent stent or bypass surgery.)
1. Antithrombotic management practices

Vitamin K practice specifies (in patients with no evidence of warfarin associated bleeding):

1j) No routine use of Vitamin K for INR between 4.5 – 10.
1k) The use of oral Vitamin K for INR >10.

In patients with warfarin associated major bleeding:

1l) Reversal may be accomplished with the addition of Vitamin K 5 -10 mg given slow IV infusion.
1m) Reversal may also be accomplished with prothrombin complex concentrate and the addition of Vitamin K 5 -10 mg given slow IV infusion.
2. Prevention & mitigation practices (all)

2a) Antithrombotics are included in the defined list of high alert medications.

2b) Practitioners are alerted to significant drug interactions for patients on antithrombotic agents.

2c) Prescribers are reminded to evaluate the need for antithrombotic therapy when antithrombotics are being held for future surgical purposes.

2d) A pharmacy managed system exists for antithrombotic drug shortage situations which outlines how standard medication safety processes will be followed.
2. Prevention & mitigation practices (all)

2e) IV antithrombotic orders cannot be entered into the pharmacy and order entry systems without including patient weight.

Smart infusion pumps are used for the IV administration of all antithrombotics (including platelet inhibitors), with functionality employed to:

2f) Intercept and prevent wrong dose errors.

2g) Intercept and prevent wrong infusion rate errors.
3. Therapeutic practices (all)

A process exists, using a standardized tool, to address and document the following prior to initiating antithrombotic therapy:

3a) Nutritional status
3b) Recent trauma
3c) Surgery
3d) Bleeding problems experienced while receiving any previous antithrombotic therapy
3e) Clotting history
3f) Drug/drug interactions
3g) Pharmacists assist with identification of alternative antithrombotic agents when contraindications exist.
3. Therapeutic practices (all)

3h) The indication and therapeutic goal for antithrombotic therapy is documented in the medical record and communicated to pharmacy for monitoring and managing patient therapy.

Processes exists for timely access to routine test results which include:

3i) INR, PTT and anti-Xa level available within 2 hours.

3j) Health care providers can readily access inpatient and outpatient laboratory results to guide antithrombotic therapy.

3k) When an antithrombotic agent is administered in the ED or other outpatient settings (e.g., cardiac cath lab, radiology), the inpatient medication record and chart is updated to communicate this information to other practitioners.
3. Therapeutic practices (all)

For critical test results reporting, the facility has defined acceptable lengths of time between:

3l) Ordering critical hematologic tests (e.g., INR, PPT) and reporting of the test results.

3m) The availability of the results and confirmation of receipt by a health care provider.

3n) The receipt of results by a health care provider and clinically appropriate antithrombotic dose changes
4, Warfarin management practices

Standard processes exist for initiation of warfarin therapy and daily dosing, which include:

4a) Collection of baseline lab values prior to prescribing anticoagulant. (e.g. warfarin-naïve patient (30 days prior), warfarin maintenance patient (24 hr prior).

4b) The INR is the primary laboratory test used to monitor and adjust warfarin therapy.

4c) Nutritional assessment

4d) Drug/drug interactions

4e) Lab values

4f) History of thrombosis or bleeding event

4g) Recent trauma or surgery
4, Warfarin management practices

4h) Ability to adjust INR target range for clinical indication.

4i) Screening for interactions between enteral nutrition products and antithrombotic therapy. (e.g., drug/tube feed interactions.)

4j) Obtaining blood draws for INR at the same time each day.

4k) Administering warfarin at the same time each day after INR results are available (e.g., afternoon / evening)

4l) Warfarin is started on Day 1 or 2 of LMWH or UFH therapy initiation.
4, Warfarin management practices

4m) Pharmacists can automatically modify warfarin therapy doses or directly contact the prescriber when laboratory values are below or above approved target ranges.

4n) When warfarin therapy is initiated for a patient with active thrombosis, heparin or LMWH is continued until warfarin has been administered for a minimum of 5 (five) days and the INR reaches a therapeutic level for 2 (two) consecutive days.

4o) A process exists for detection of contraindication of warfarin in pregnancy.
5. Warfarin prevention & mitigation practices

**Warfarin management practices include:**

5a) Notification of dietary services when a patient is receiving warfarin therapy.

5b) Automatic nutrition consults when patients are first placed on warfarin to avoid drug-food interactions

5c) Warfarin is dispensed in unit dose only (e.g., warfarin tablets are not split).

5d) Warfarin is not available as floor stock unless stored in an automated dispensing cabinet that is interfaced with pharmacy.

5e) All strengths of warfarin tablets dispensed within the facility are purchased from a single manufacturer.
5. Warfarin prevention & mitigation practices

The facility’s practice for handoff communication to the next provider of care includes:

5f) Inpatient warfarin dosing history
5g) Inpatient INR value history
5h) Date the next INR is due
5i) Daily warfarin dosing schedule to be followed until date of next INR
5j) A confirmed appointment scheduled for laboratory, physician, and/or antithrombotic clinic
5. Warfarin prevention & mitigation practices

The facility’s practice for patients who are being discharged on warfarin therapy and have a sub-therapeutic INR includes a transition plan for:

5k) Consistent evaluation regarding the need for LMWH until a therapeutic INR is reached

5l) Maintaining patient on LMWH until a therapeutic INR is reached, (when appropriate)
6) Parenteral anticoagulant management practices

**Processes are in place for:**

6a) Safely managing the care & removal of epidural catheters placed during regional anesthesia when LMWH has been administered.

6b) Monitoring and/or discontinuing antithrombotic therapy prior to invasive procedures. (e.g., INR within specific range or target.)

6c) Only continuous infusions are used for therapeutic IV heparin (no intermittent IV administration).

6d) When LMWH or UFH therapy is greater than 3 days, a process exists that ensures that a platelet count and serum creatinine are repeated every 3 days.
6) Parenteral anticoagulant management practices

6e) Standard guidelines are used for laboratory monitoring of LMWH in special populations (e.g. renal dosing, pregnancy, and morbid obesity)

When laboratory reagents that are used to measure the PTT or other hematological tests are changed a process exists to:

6f) Inform prescribers, pharmacists and nurses about the change.

6g) Update affected dosing protocols and order sets.
7) Parenteral anticoagulant prevention & mitigation strategies

Processes exist to eliminate errors in preparation, storage, and dispensing which includes:

7a) Utilizing unit dose LMWH (round to the nearest dose if using a pen)

7b) Limiting concentrations of Heparin stored in automated dispensing machines and as floor stock (e.g., Do not store 10,000 units/mL 1mL vials)

Dispensing commercially prepared, pre-mixed IV solutions of UFH:

7c) In limited concentrations.

7d) In limited vial sizes.

7e) In prefilled heparin flush syringes.
7) Parenteral anticoagulant prevention & mitigation strategies

Independent double-check for UFH are used (e.g., with smart pump technology and/or nurse double-check) with:

7f) Each new bag hung
7g) Each rate change
8) Parenteral anticoagulant therapeutic strategies

Processes exist to initiate and monitor heparin via lab values including:

8a) A baseline hemoglobin, hematocrit, serum creatinine and platelet count are obtained prior to initiating antithrombotic therapy with UFH or LMWH.

8b) PTTs are obtained no sooner than 6-8 hours after UFH initiation.

8c) Laboratory tests have standard intervals for assessment. (e.g., hgb every 3 days, platelets every 3 days.)

8d) Prior to ordering any heparin product, prescribers are required to specifically ask patients if they have a known history of heparin induced thrombocytopenia (HIT) and/or an allergy to heparin; and positive responses are documented in the medical record.
8) Parenteral anticoagulant therapeutic strategies

8e) A VTE prophylaxis protocol exists and is used for acutely ill or critically ill medical patients that includes use of low dose UFH, LMWH or fondaparinux.

8f) The renal dosing program allows a pharmacist or prescriber to routinely adjust the doses of LMWH, Factor Xa inhibitors, and direct thrombin inhibitors.

8g) The documentation process for LMWH injections includes date and time of dose, and site of injection.

For patients on UFH:

8h) If platelet count decreases to less than 100,000/mm³ or less than 50% of the baseline that the patient is evaluated for HIT in real-time.

8i) If the patient is diagnosed with HIT, all sources of heparin are discontinued including heparin flush.
9) Implement appropriate critical thinking and knowledge strategies

Interdisciplinary education on antithrombotic therapy is provided and includes:

9a) Initial training for new hires and existing staff, including protocols and guidelines.

9b) Post test incorporating a case-study approach to demonstrate proficiency.

9c) Plan for targeting gaps in knowledge.

9d) Ongoing antithrombotic education is provided to direct care staff when new relevant information is available.
10) Provide patient and family education

10a) When initiating therapy, patients/caregivers receive verbal & written information on purpose, action, side effects, & monitoring. Processes exist to educate patients & families, using teach-back method, to ensure safe therapy including:

10b) Indication
10c) Symptoms for monitoring
10d) Dietary issues
10e) Drug interactions
10f) Disease interactions
10g) Monitoring requirements
10h) Duration of therapy
10i) Potential adverse effects
10j) Pharmacists are available for consultations to assist with patient
Questions and Discussion