114BEvidence Tables for Chapter 3. High-Alert Drugs: Patient Safety Practices for Intravenous Anticoagulants

Table 1, Chapter 3. Evidence table

| **Author, year** | **Description of PSP**  **Multi-component** | **Study Design**  **Sample Size** | **Theory or Logic Model** | **Description of Organization** | **Contexts** | **Implementation Details** | **Outcomes: Benefits** | **Outcomes: Harms** | **Influence of Contexts on Outcomes** | **Comments** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Baird, 20011 | A single protocol for heparin administration was developed by a team of doctors, nurses and a pharmacists. | Pre-post  58 patients on 5 physician-specific protocols; 10 patients on new protocols. | Not reported | large tertiary care hospital-intensive care units, 115 beds | Leadership : Protocol development team | None. | Received optimal bolus dose Results: 5 (8.6%) pre vs: 10 (90%) post  Statistics: NR  Mean time to anticoagulation  Results: 34 hrs vs 63 +- 49 hours  Statistics: NR | Not reported | Not reported |  |
| Fanikos, 20072 | Smart pump; drug library with point-of-care decision support for high orlow infusion rates; can infusing 4 drugs simultaneously; programmable hard drug alerts  smart infusion device with a hospital-determined drug library and software | Pre-post  7,395 medication alerts from a possible 14,012 administered heparin doses in 3,674 patients | Not reported | Brigham and Women’s Hospital | Implementation tools : Est. hard limits for rates outside the defined guardrails & soft-limits for anticoagulants | None stated. | Results: Anticoagulation medication errors: 49 before; 48 after  Statistics: NS | Not reported | Not reported | Results post implementation only: Prevented 10-fold overdose in 40 patients; 100-fold overdose in 40 patients; and >100-fold overdose in 10 patients; similar results for under doses; heparin was #4 most common drug generating alerts |
| Fraipont, 20033 | Nurse-directed weight-based nomogram | Pre-post  19 nomogram, 19 not | Not reported | 8-bed Intensive care unit in 635-bed university hospital in Belgium | Implementation tools : Raschke nomogram |  | Time to therapeutic anticoagulation: 13.5 hours standard vs 9.5 hours nomogram, NS  Complications: 2 standard vs 1 nomogram, NS | Not reported | Not reported |  |
| Oyen, 20054 | Computerized nomogram for acute coronary syndromes | Pre-post  419 nomogram, 98 comparison | Logic model | Cardiovascular services (88 beds) at a 1300-bed teaching hospital | Implementation tools: Dosing based on US organization guidelines | Ot described | Percentage aPTT in goal range  Results: 44% nomogram vs 27% not  Statistic: p<0.01  Time to goal aPTT  Result: 0.42 days nomogram, 1.6 days not  Statistic: p<0.01 | Not reported | Not reported | Complications not reported; discussion that on prior paper nomogram, clinicians deviated over 50% of the time by adjusting doses; program provided feedback and performed calculations; computerization allowed individualized protocol for acute coronary syndromes |
| Prusch, 20115 | Intelligent infusion devices (IIDs), bar-code-assisted medication administration system, and electronic medication administration record system- integrated to populate provider-ordered, pharmacist-validated infusion parameters on IIDs  IV interoperability | Pre-post  16,533 opportunities pre and 16,833 opportunities post-implementation | Model for how IID works | 538-bed community teaching hospital - expanded to all units | Organizational characteristics : multidisciplinary team and relationship with BCMA and IID vendors to develop interoperability between systems  Leadership : Executive sponsorship, Direction and support of pharmacy and therapeutics committee  Implementation tools : Nurse education | preparation, pilot, validation, and expansion; extensive software design and testing before introduction to patient care | Telemetry drug library monthly compliance  Results: 56.5 pre to 72.1 post  Statistics: p<0.001  Number of telemetry manual pump edits  Results: 56.9 to 14.7  Statistics: p<0.001 | Not reported | Not reported | similar decrease in medical-surgical drug library results; reduction in monthly reported intravenous heparin errors (28 to 17, NS); cost: 24.8% reduction (23.4 sec onds) in the mean nursing time for pump programming; 90% compliance |
| Toth, 20026 | Weight-basednomogram for heparin dosing in TIA and/or stroke. | RCT  206 patients | Not reported | Neurology ward, Canada |  |  | Results: Total complications: 9 pre (8.5%) vs 2 post (2%) Statistics: p=0.04  Supratherapeutic aPTT  Results: 1.1 nomogram vs. 1.6 no nomogram  Statistics: p=0.01  Time to therapeutic-range aPTT  Results: 13 nomogram, 18 no nomogram  Statistics: p<0.01 | Not reported | Not reported | Doctor completed nomogram; bolus provided if indicated.Initial heparin found by nomogram. Nurses changed heparin from aPTT results by following nomogram. Also, significantly fewer calls to house staff and mistakes made in nomogram group. Time to discontinue heparin:4 ±02.8 vs. 4.6±3.8; P=0.33; 94% of staff preferred use of nomogram |
| Zimmermann, 20037 | Weight-based heparin nomogram for patients with acute coronary syndromes | Pre-post  84 patients weight-based, 89 patients in non-weight-based | Not reported | Public hospital |  | Weight-based nomogram was based on other nomograms in literature; dosage based on absolute weight. Weight and aPTT determined later adjustment in infusion rate. | Results: Time to first therapeutic aPTT: Nomogram median 8.75 vs >24 hours  Statistics: (p<0.001)  Mean number of aPTT determinations  Results: 3.62(.85) (no nomogram) vs 4.15 (.83) (nomogram)  Statistics: (p=0.002)  Major hemorrhagic events  Results: 4 (4.5%) non-weight-based, vs 2 (2.4%) weight-based, NS | Not reported | Not reported | Adherence to nomograms was “good” (not described in detail) |

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