Smart Pumps: Achieving 100% Drug Library Compliance and Averting Medication Errors

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Smart Pump Project

- In 2011, over 400 BBraun Outlook ES IV smart pumps installed throughout our health system
- Removed all old technology infusion pumps that had limited safeguards
  - ***Relied on manual programming for accuracy***
  - ***Relied on direct observation/self reporting for medication errors***
- Success was due to our multidisciplinary team and senior leadership support to uphold the culture of safety of our organization

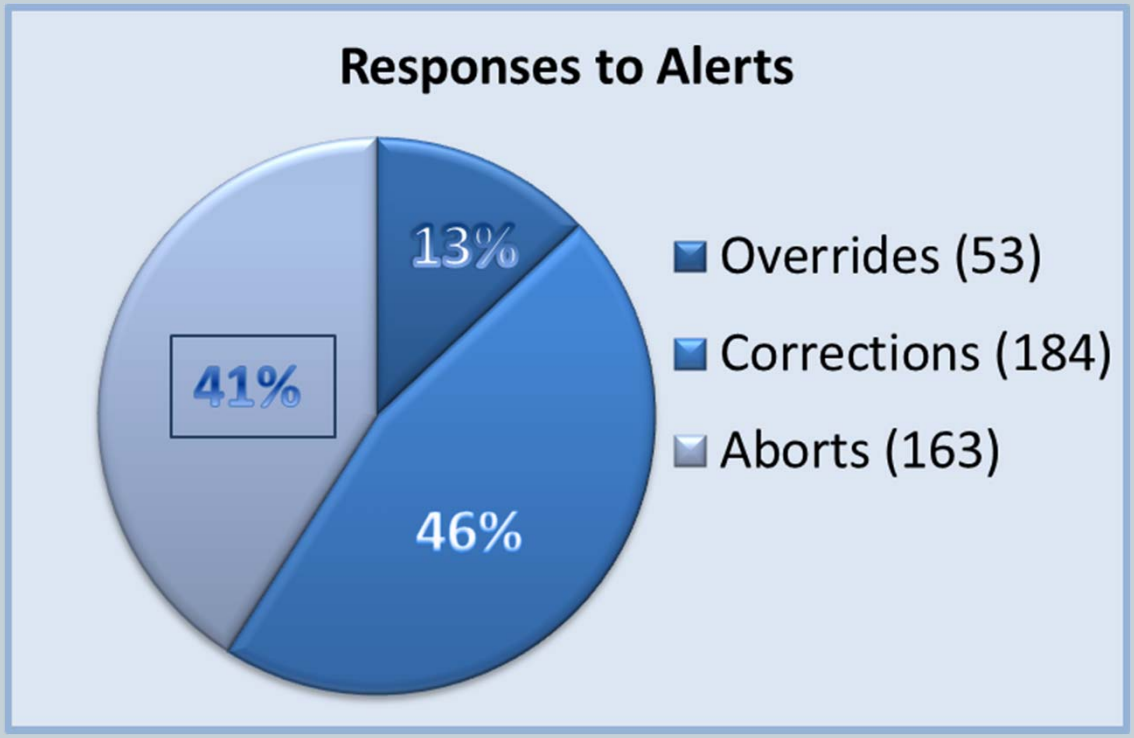
Drug Libraries

- Drug libraries were developed as a collaborative effort between pharmacy, physicians and bedside nurses
  - ***Variability in concentrations/dosing was standardized***
- Utilized clinical advisories, adding double checks to high risk meds including insulin and heparin
- Soft max and hard max limits alert clinicians, help to prevent errors
- Clinicians with a variety of critical care experience including floating staff are able to effectively titrate infusions in a safe environment

Achieving 100% Compliance

- Established targets of 95% across key infusion metrics
  - Dose delivered infusions
  - Rate delivered infusions
  - Correct location
  - Correct care area
    - *Initial compliance 49-93% six weeks post implementation*

Clinician Responses to Alerts



- ***13% Overrides-Clinician alerted & continued with programming***
- ***41% Corrections-Clinician alerted and corrections made***
- ***46% Aborts-Clinician alerted and programming ended***

Educational Opportunities

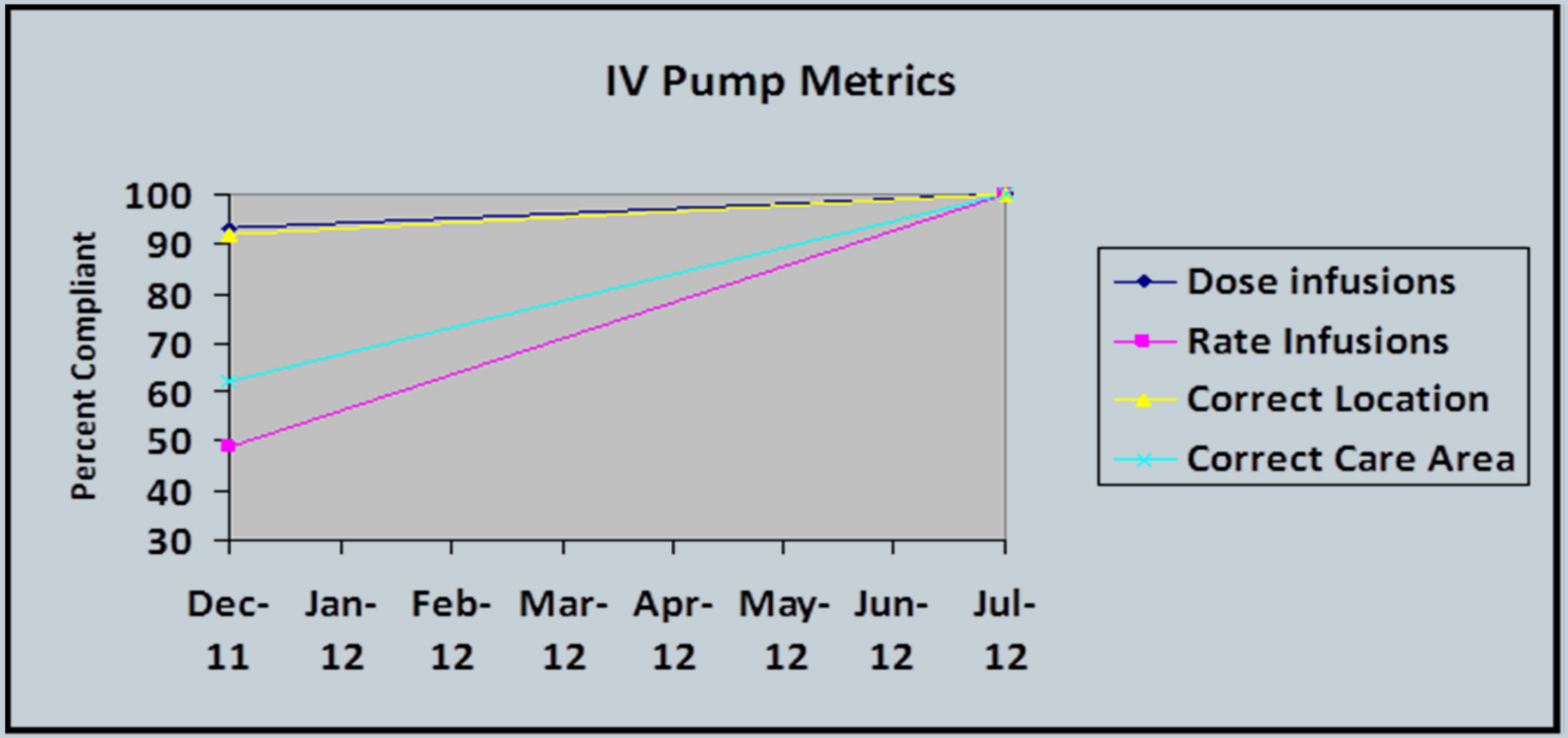
- Found in practice staff increasing rate to bolus patient rather than using the bolus feature
- Communication to staff regarding outcomes, “good catches” and averted errors provides “real-life” examples and promotes staff buy-in.
  - ***Insulin entered as the bag volume 100 rather than the rate of 10 units/hour***
- Newsletter talked about life threatening events related to smart pumps and preventable infusion errors.

Real Time Audits

- Implemented weekly audits
- Provide direct observation to document compliance and identify barriers

Outlook ES DoseGuard and RateGuard Drug Library Compliance Audit								
Unit: _____ Census: _____ Date: _____ Auditor: _____								
Room/ Bed :	Total # Pumps	DoseGuard Appropriate Y/N or N/A	RateGuard Appropriate Y/N or N/A	Correct Location Y/N	Correct Care Area Y/N	Patient ID Y/N	Nurse's Name	Comments: (Include drug names for inappropriate use of drug library)

Compliance Monitoring



Compliance Rates

	Target	12-2011	7-2012
Dose Delivered	95%	93%	100%
Rate Delivered	95%	49%	100%
Correct Location	95%	92%	100%
Correct Care Area	95%	62%	100%

Ongoing Performance Improvement

- Audits continue monthly on all in-patient units.
- On the spot feedback and education
- Ongoing data reports to staff and nursing management
- Accountability
- Are we always 100%??? No!!!
  - ***Ongoing Challenge***
- Retrospective review of DoseGuard & RateGuard alerts, increasing awareness of practice issues, learning opportunities

BBraun Analytics

DoseTrac Report Writer — **Western Maryland Health System**

Responses by Limit -- All Alerts

02/08/2015 - 02/14/2015

Care area = <All>, Titrations excluded

	Total	Hard Min			Soft Min				Soft Max				Hard Max		
Location ▲	Alerts	Correction	Abort	Total	Correction	Override	Abort	Total	Correction	Override	Abort	Total	Correction	Abort	Total
5 WEST	2	0	0	0	0	0	0	0	1	0	1	2	0	0	0
7 SOUTH	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1
ER	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0
HLC	1	0	0	0	0	0	0	0	1	0	0	1	0	0	0
ICU	5	0	0	0	0	0	0	0	2	3	0	5	0	0	0
L&D-OB	8	0	0	0	0	0	0	0	1	4	3	8	0	0	0
ONCOL-OP	22	0	0	0	0	0	0	0	0	13	3	16	1	5	6
PCU	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Totals	**41**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**21**	**7**	**33**	**2**	**6**	**8**

Alert Detail Report – Programming Sequence

Programming Sequence Surrounding Alert Report (Pump S/N = E

Timestamp	Mode	Drug Name	Concentration	Rate	Dosage	VTBD	Dose Deliv'd	Volume Deliv'd
01/14/12 18:08:09	DoseGrd	Propofol	500.0 mg in 50 ml	16	44.4 mcg/kg/min	42	3.0	0.3
01/14/12 18:09:07	DoseGrd	Propofol	500.0 mg in 50 ml	916	2544.0 mcg/kg/min			
01/14/12 18:09:07	DoseGrd	Propofol	500.0 mg in 50 ml	916	2544.0 mcg/kg/min	41.7	20.0	2.0
01/14/12 18:09:45	DoseGrd	Propofol	500.0 mg in 50 ml	16	44.4 mcg/kg/min	39.3	181.0	18.1

DoseTrac® Infusion Management Software

B|BRAUN SHARING EXPERTISE

Real Time Status View

ICU

Pump S/N	Room-Bed	Patient Id	Nurse Id	Mode	State	Drug Name	Concentration	Rate	Dosage	VTBD	Time Left (Mins) ▲	Alarm
000099		P00022222	N00012	Dose	KVO	Isoproterenol	1 mg in 250 ml	3	0.57 mcg/kg/min	0	0	n/a
000127		P00282111	N00122	Dose	Run	Isoproterenol	1 mg in 250 ml	747	0.67 mcg/kg/min	130.5	10	n/a
000101		P00272074	N00122	Dose	Run	Amiodarone	150 mg in 100 ml	25.2	0.63 mg/min	42.5	101	n/a
000137		P00012055	N00012	Dose	Run	Isoproterenol	1 mg in 250 ml	42	2.80 mcg/min	192.9	275	n/a
000073		P00162111	N00072	Dose	Alarm	Phenylephrine	10 mg in 250 ml	35.9	23.9 mcg/min	167.3	279	Occlusion
000106		P00122074	N00052	Dose	Run	Diltiazem	100 mg in 100 ml	14.2	14.2 mg/hr	96.4	407	n/a
000072		P00112037	N00052	Dose	Run	Amiodarone	450 mg in 250 ml	27	0.81 mg/min	184.8	410	n/a
000013		P00292222	N00132	Dose	Run	NOREPInephrine	16 mg in 250 ml	26.7	28.5 mcg/min	202.4	454	n/a
000078		P00022222	N00012	Dose	Run	DOPamine	400 mg in 250 ml	26.6	9.95 mcg/kg/min	216.5	488	n/a
000140		P00152111	N00072	Dose	Run	Phenylephrine	40 mg in 250 ml	29.3	78.1 mcg/min	248.4	508	n/a
000122		P00152111	N00072	Dose	Run	Amiodarone	450 mg in 250 ml	28	0.84 mg/min	245.2	525	n/a
000034		P00012055	N00012	Dose	Run	Amiodarone	450 mg in 250 ml	23.7	0.71 mg/min	218.5	553	n/a
000146		P00022222	N00012	Dose	Run	Diltiazem	100 mg in 100 ml	7.3	7.31 mg/hr	85.9	704	n/a
000018		P00112037	N00052	Dose	Run	Midazolam	50 mg in 50 ml	3.1	3.11 mg/hr	41.4	799	n/a
000068		P00012055	N00012	Dose	Run	Procainamide	4 g in 250 ml	11.3	3.02 mg/min	234.8	1243	n/a
000044		P00122074	N00052	Dose	Run	KCL	20 mEq in 100 ml	3.1	0.61 mEq/hr	88.9	1748	n/a
000080		P00162111	N00072	Dose	Run	Phenylephrine	40 mg in 250 ml	7.1	0.35 mcg/kg/min	248.7	2087	n/a

Lessons Learned

- Ongoing Education
  - ***New staff, turnover, transfer within departments, bolusing, new medications***
- Ongoing Communication with Staff
  - ***Outcomes, good catches, averted errors***
- Alert fatigue from soft maximum limits set too low vs. actual infusion practices was a concern
  - ***Limits adjusted to prevent potential alert fatigue and maintain safe dosing***
- Champions and Leadership support are keys to success!

Western Maryland Health System