Appendix 1. Operational definitions of medication errors for data collection & modifications from Husch et al.[8]

Error type	Definition
1. Wrong dose	The same medication but the dose is different from the prescribed order.
2. Wrong rate	A different rate is displayed on the pump from that prescribed in the medical record. Also refers to weight based doses calculated incorrectly including using a wrong weight.
3. Wrong concentration*	An amount of a medication in a unit of solution that is different from the prescribed order.
4. Wrong IV fluids/medications	A different fluid/medication as documented on the IV bag label is being infused compared with the order in the medical record.
5. Delay	An order to start or change medication or rate not carried out within 4 hours of the written order or intended start time per institution policy.
6. Omission of IV fluids/medications*	The medication ordered was not administered to a patient or administered anytime after 4 hours of the intended start time.
7. Unauthorized medication	Fluids/medications are administered to the patient but no order is present in medical record. This includes failure to document a verbal order.
8. Patient identification (ID) error (wrong patient)	Patient either has no ID band on or information on the ID band or label is incorrect.
9. Smart pump or drug library not used*	Smart pump is not used (bypassing smart pump) or smart pump was used but the drug library was not selected, rather manual entry mode was used (bypassing drug library)
10. Oversight allergy*	Medication is administered to a patient with a known allergy to the drug or class.
11. Pump seting error	Setting programmed into the pump is different from the prescribed order.
12. Label not complete according to policy**	Documented information on the medication label is different from required information per institution policy.
13. Tubing not tagged according to policy***	IV tubing change label is not tagged per institution policy.
14. Expired drug***	The expiration date or time of the fluids/medications has passed.

*added category from Rothschild's study[7] ** "No rate documented on label" error was modified to "label not complete according to policy" because most of participating hospitals' IV labeling policy did not require rate information on labels."Incorrect rate on label—rate documented on the medication label is different from that programmed into the pump"—was changed to ". Label not complete according to policy" and "Pump setting error" categories. ***added new category for this study

Appendix 2. NCC MERP Harm Index* [12]

(A) Capacity to cause error
(B) An error occurred but did not reach the patient
(C) Errors unlikely to cause harm despite reaching the patient
(D) Errors that would have required increased monitoring to preclude harm
(E) Errors likely to cause temporary harm
(F) Errors that would have caused temporary harm and prolonged hospitalization
(G) Errors which would have produced permanent harm
(H) Errors that would have been life threatening
(I) Errors that would likely have resulted in death

*Harm index definition was slightly modified for the study[13]

Appendix 3. Participating institution's demographics

	Site A	Site B	Site C	Site D	Site E	Site F	Site G	Site H	Site I	Site J
Hospital type	AMC	AMC	CH	AMC	AMC	CH	CH	AMC	AMC	AMC
Pump vendor -large IV	Care fusion	Care fusion	B.Braun	Care fusion	Baxter	Care fusion	Care fusion	Care fusion	Baxter	Care fusion
-PCA/Syringe			Smiths Medical		Smiths Medical				Smiths Medical	
Number of beds	1025	325	441	982	371	350	640	793	1057	511
CPOE	x	x	x	x	x	x	x*	x	x	x
eMAR	x	x	x	x	x	x	x	x	x	x
BCMA	x	x	x		x	x	x	x	x	x

AMC, academic medical center; CH, community hospital; CPOE, computerized physician order entry; eMAR, electronic medication administration record; BCMA, barcode-assisted medication administration; x, yes

*implemented during intervention period