

**Table 2. Characteristics of included studies - Medicatiebibliotheken**

Study	Participants	Comparison	Follow-up	Outcome measures	Comments	Risk of bias (per outcome measure)*
Guerin, 2015	N not specified  Patient characteristics not further specified	Intervention:  Implementation of smart pumps (n=1045; about 60 % Infusomat and About 40 % Perfusor Space from B. Braun, Melsungen, Germany) with developed and approved libraries and limits. Training was provided in the month before go-live. Support 24/7 was offered throughout the first two weeks after implementation.  Control:  Not specified – before implementation	Before: from October 2010 to 5 November 2011  After:  From 10 November 2011 to 5 November 2012 (0-1 year after implementation)  And  From 6 November 2012 to 5 November 2013 (1-2 years after implementation)	accidents and incidents related to intravenous drug administration	Retrospective before-after study in a mother-child hospital with 500 beds.  Implementation was performed 9 November 2011.	High
Howlett, 2020	I: 246 infusions C: 138 infusions  Patient characteristics:  Age: Intervention: Preterm 7 (10.9%) Neonate 20 (31.3%)	Intervention:  a locally devised smart-pump drug library of  SCIs across four weight bands (5, >5–10, >10– 20, and >20 kg) was uploaded onto “smart” syringe drivers and  large-volume infusion pumps (B. Braun Space pumps, Melsungen,	Before:  Januari-December 2011 (6 random weeks)  After:  May-November 2012 (6 random weeks, 0-6 months after implementation)	Infusion related prescribing errors	Retrospective before-after study in 23-bed PICU in an Irish tertiary pediatric hospital.  Implementation of smart pumps was performed in May 2012.	High

	<p>1 month – 1 year 18 (28.1%)  &gt;1 year -40kg 17 (26.6%)  &gt;40 kg 2 (3.1%)</p> <p>Control:  Preterm 5 (6.8%)  Neonate 15 (20.3%)  1 month – 1 year 35 (47.3%)  &gt;1 year -40kg 17 (23.0%)  &gt;40 kg 2 (2.7%)</p> <p>Age:  Intervention:  male/female 33/31</p> <p>Control:  male/female 39/35</p>	Germany)				
Lyons, 2018	<p>N 1326 patients (2008 infusions)</p> <p>I: 640 infusions (I1: with used drug library: 356  I2: drug library not used although relevant drug listed: 67</p>	<p>Intervention:  Smart pumps (infusion pump with a drug library and/or dose error reduction software enabled)</p> <p>Control:  Pump with no smart features enabled</p>	April 2015 – December 2016	intravenous infusion administration deviations	Cross-sectional study in 16 hospitals. 11 of these hospitals did (partly) use smart pumps	High

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	<p>I3: drug library not used as relevant drug not listed: 215 I4: not known: 3</p> <p>C: 1202 infusions</p> <p>Patient characteristics not further specified</p>					
Pang, 2011	<p>N 698 infusions</p> <p>I1: with guardrails: 165 infusions I2: without guardrails: 101 infusions</p> <p>C: 432 infusions</p> <p>Patient characteristics not further specified</p>	<p>Intervention:</p> <p>Implementation of Alaris GP pumps with Guardrails software (CareFusion). 600 infusion protocols involving 89 medicines were developed to form the drug library. The drug library was approved by the hospital's Drugs and Therapeutics Committee and programmed into the Guardrails software. Pumps were introduced to the wards in tandem with staff education and promotional activities to increase uptake of Guardrails.</p>	<p>Before: 41 days (November to December 2007) during weekday business hours</p> <p>After:</p> <p>27 working days from January to February 2010 (1.5 years after implementation)</p>	Intravenous medication administration errors	<p>Prospective before-after study in a 380-bed acute teaching hospital.</p> <p>Implementation of Alaris GP pumps was performed in May 2008.</p>	High

		Control: Before: IMED Gemini Volumetric Infusion Pumps				
Wiseman, 2018	I1: April 2012: 658 infusions I2: June 2014: 701 infusions  C: 744 infusions	I: implementation of smart pump technology (Carefusion Alaris PC Guardrails Suite MX, San Diego, CA, USA) including first data set  Release  C: Before, not further specified	Before: July 2011  After: April 2012 (0.5 years after implementation) and June 2014 (2.5 years after implementation)	intravenous medication infusion error	Prospective before-after study in a 450-bed tertiary referral metropolitan hospital, across 15 general and critical care ward areas.  Implementation of smart pump technology was performed in November 2011.  Note that a pre-intervention 'Clinical pharmacist annotation on medication charts' was implemented before implementing smart pumps. Baseline data was collected after that intervention.	High

*\*For further details, see risk of bias table in the appendix*