

Table 1 (Supplementary file) Characteristics of data collection, study design and methodological quality score using Mixed Method Appraisal Tool research categories and methodological quality criteria for all included studies in hospital inpatient settings.

1st author (year)	country of origin	Population	study aim	primary method(s) of data collection	*Primary category of study design [secondary category]	**Tool score
Studies with an intervention						
Debono <i>et al.</i> , (2017)(30)	Australia	Adult	To identify perceived barriers and targeted interventions to enhance appropriate use of electronic medication management systems.	Interviews	Qualitative Study [Qualitative description]	100
Durham <i>et al.</i> , (2016)(38)	USA	Adult	To increase nurse sensitivity to potential error risk, improve behaviours, and reduce observed medication administration errors.	Observation	Qualitative Study [Process improvement]	100
Eisenhauer <i>et al.</i> , (2007)(31)	USA	Adult	To document nurses' reported thinking processes during medication administration before and after implementation of point-of-care technology.	Interviews	Qualitative Study [Narrative research]	100
Freeman <i>et al.</i> , (2013)(26)	USA	Adult	To reduce the number of interruptions during medication administration.	Observation and error report	Quantitative non-randomised study [Before and after time series study]	25
Holden <i>et al.</i> , (2013)(24)	USA	paediatrics	To investigate how barcode medication administration alters nursing work, and the nature of problem-solving behaviour following its implementation.	Observation and interviews	Qualitative Study [Qualitative description]	100
Holden <i>et al.</i> , (2015)(27)	USA	paediatrics	To assess the short- and long-term impact of bar-coded medication administration on nurses' mental	Survey	Quantitative non-randomised study [Before and after time series study]	75

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			workload as well as on perceived medication safety.			
McAlearney <i>et al.</i> , (2007)(32)	USA	Adult	To explore nurses understanding of introduction and use of smart pumps	Focus groups	Qualitative Study [Qualitative description]	100
Nemeth <i>et al.</i> , (2014)(34)	USA	adult medical & surgical	To evaluate the use of an infusion device among nurses.	Observation and interview	Qualitative Study [Ethnography]	100
Niazkhani <i>et al.</i> , (2011)(35)	Netherlands	adult	To evaluate the problems and responses after introduction of computerized physician order entry system.	Interviews	Qualitative Study [Qualitative description]	75
Tucker, (2016)(28)	USA	simulation lab	To investigate the impact of work design factors on responses to operational failures.	Observation	Quantitative Randomised Control Trial [Quantitative Randomised Control Trial]	75
Van Ornum, (2018)(29)	USA	Adult	To improve barcode medication administration compliance.	Medication scanning reports	Quantitative non-randomised Study [Cross-sectional analytic study]	100
Non-interventional studies						
Boonen <i>et al.</i> , (2017)(48)	Netherlands	adult	To explore the impact of nursing practice when working with bar-coded medication administration technology	Institutional ethnography Observation	Qualitative Study [Ethnography]	100

1st author (year)	country of origin	Population	study aim	primary method(s) of data collection	*Primary category of study design [secondary category]	**Tool score
Boonen <i>et al.</i> , (2018)(37)	Netherlands	adult	To assess how care is mediated through technology by analysing the interaction between nurses, patients, and a Bar Coded Medication Administration system.	Institutional ethnography Observation	Qualitative Study [Ethnography]	75
Boonen <i>et al.</i> , (2020)(36)	Netherlands	adult	To determine how, from a standpoint of nurses, the use of bar-coded medication technology institutionally and textually mediates nurses' deliberations in the process of decision-making.	Institutional ethnography Observation	Qualitative Study [Ethnography]	75
Borrott <i>et al.</i> , (2017)(51)	Australia	paediatrics	To examine how communication between nurses and doctors occurred for managing medications.	Interview, observation, focus group	Qualitative Study [Ethnography]	100
Jennings <i>et al.</i> , (2011)(47)	USA	adult	To describe medication administration and managing strategies in everyday clinical practice.	Observation & interview	Qualitative Study [Ethnography]	75
Aydon <i>et al.</i> , (2016)(50)	Australia	paediatrics neonatal ICU	To identify factors that influence nurse's decisions to question concerning aspects of medication administration.	Interview	Qualitative Study [Qualitative description]	100
Dickson & Flynn (2012)(45)	USA	adult medical & surgical	To explore nurses' clinical reasoning and actions to intercept medication errors	Interview	Qualitative Study [Grounded theory]	100

1st author (year)	country of origin	Population	study aim	primary method(s) of data collection	*Primary category of study design [secondary category]	**Tool score
Braaf <i>et al.</i> , (2015)(52)	Australia	adult	To investigate what and how medication information is communicated during handover interactions.	Observation	Qualitative Study [Qualitative description]	100
Colligan & Bass., (2012)(41)	USA	paediatrics	To identify types of interruptions and strategies for safe medication administration and interruption management.,	Semi-structured interview	Qualitative Study [Qualitative description]	75
Davis <i>et al.</i> , (2005)(46)	Australia	paediatrics	To identify nurses' attitudes toward medication policies and perceived factors influencing nurses' adherence to the medication policy	Focus group	Qualitative Study [Qualitative description]	100
Johnson <i>et al.</i> , (2018)(42)	Australia	adult	To examine the nature of interruptions during medication administration.	Focus group	Qualitative Study [Qualitative description]	100
Martyn & Paliadelis (2019)(49)	Australia	adult	To explore nurses' medication administration experiences.	Observation & interviews	Qualitative Study [Qualitative description]	100
Sitterding <i>et al.</i> , (2014)(43)	USA	adult acute	To describe situational awareness during medication administration, and interruption handling strategies.	Observation	Qualitative Study [Qualitative description]	100
Vos <i>et al.</i> , (2020)(13)	England	mixed: adult & paediatric	To explore ways in which nurses contribute to system-level resilience when administering intravenous infusions.	Focus groups & debriefs	Qualitative Study [Qualitative description]	100

1st author (year)	country of origin	Population	study aim	primary method(s) of data collection	*Primary category of study design [secondary category]	**Tool score
Martyn & Paliadelis (2019)(2)	Australia	adult	To explore the participants' application of the five-rights of medication administration in practice.	Observation	Qualitative Study [Qualitative description]	100
Alper <i>et al.</i> , (2012)(39)	USA	paediatrics	To assess the extent of violations in the medication administration process among nurses.	Cross-sectional survey	Quantitative descriptive Study [Survey]	100
Davis <i>et al.</i> , (2010)(53)	Australia	paediatrics	To evaluate the importance of contextual and policy factors on nurses' judgement about medication administration practice.	Cross-sectional survey	Quantitative descriptive Study [Survey]	100
Halbesleben <i>et al.</i> , (2013)(40)	USA	adult	To examine relationships between emotional exhaustion and potentially unsafe work practices (workarounds) in medication administration.	Survey	Quantitative descriptive Study [Survey]	100
Alteren <i>et al.</i> , (2018)(25)	Norway	adult	To describe nurses' behaviours and interruptions during medication administration.	Observation	Quantitative descriptive Study [Incidence or prevalence study without comparison group]	75
McLeod <i>et al.</i> , (2015)(44)	UK	adult	To identify system factors that facilitate and/or hinder successful medication administration focused on three inter-related areas: nurse practices and workarounds, workflow, and interruptions and distractions.	Observation & participant narratives	Mixed methods [Qualitative & Quantitative descriptive]	100
Rack <i>et al.</i> , (2012)(33)	USA	adult medical & surgical	To determine the existence, frequency, and potential causes of nursing workarounds, and error reduction, when implementing a bar code medication administration system.	Focus group and survey	Mixed methods [Qualitative & Quantitative descriptive]	75

*Mixed Methods Appraisal Tool study design categories: Qualitative; Quantitative randomised controlled trials; Quantitative non-randomised; Quantitative descriptive; Mixed methods. ** Mixed Methods Appraisal Tool score: 0, 25, 50, 75 or 100 where 0= poor quality, 100 = high quality