

**DEVELOPMENT AND VALIDATION OF
QUALITY INDICATORS FOR PEDIATRIC
RESPIRATORY CARE IN EMERGENCY
DEPARTMENTS IN JORDAN**

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UNIVERSITI SAINS MALAYSIA

2025

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RESPIRATORY CARE IN EMERGENCY
DEPARTMENTS IN JORDAN**

by

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**Thesis submitted in fulfilment of the requirements
for the degree of
Doctor of Philosophy**

November 2025

ACKNOWLEDGEMENT

Praise be to Allah, who has blessed me with the strength to complete my doctoral journey and accomplish this thesis. I would like to express my deep appreciation and heartfelt gratitude to my family, my father, mother, brothers, and sisters, for their endless and unwavering support during the challenging times of studying and working. I am sincerely grateful to my main supervisor, Dato' Prof. Nik Hisamuddin Nik Ab. Rahman, for his continuous support, valuable advice, encouragement, motivation, and significant contribution throughout the research and completion of this thesis. My sincere appreciation also goes to my co-supervisors, Dr. Ahmad A. Alrawashdeh from Jordan University of Science and Technology, and Dr. Mohd Hashairi Hj. Fauzi, for their exceptional academic guidance, steadfast support, and invaluable mentorship. I would also like to thank the Ministry of Health in Jordan for granting the necessary approvals and permitting the conduct of this study in their institutions. Finally, my deepest thanks go to all the participants, specialist physicians, consultants, and experts who contributed to this research.

TABLE OF CONTENTS

ACKNOWLEDGEMENT	ii
TABLE OF CONTENTS.....	iii
LIST OF TABLES	xi
LIST OF FIGURES	xii
LIST OF SYMBOLS	xiii
LIST OF ABBREVIATIONS	xiv
LIST OF APPENDICES	xvi
ABSTRAK	xvii
ABSTRACT	xix
CHAPTER 1 INTRODUCTION.....	1
1.1 Introduction	1
1.2 Background	1
1.3 Problem Statement	7
1.4 Rationale of the Study	10
1.5 Significance of the Study	12
1.6 Research Questions	13
1.6.1 Phase I: Systematic Review and Meta-Analysis	13
1.6.2 Phase II: Design and Development of Quality Indicators.....	13
1.6.3 Phase III: Evaluation of the Developed Quality Indicators.....	14
1.7 Research Objectives	14
1.7.1 General Objective.....	14
1.7.2 Specific Objectives.....	14
1.7.2(a) Phase I: Systematic Review and Meta-Analysis	14
1.7.2(b) Phase II: Design and Development of Quality Indicators	14

1.7.2(c)	Phase III: Evaluation of the Developed Quality Indicators	14
1.8	Definition of the Study Terms.....	15
1.8.1	Quality Indicators (QIs)	15
1.8.2	Emergency Department (ED).....	15
1.8.3	Pediatric Respiratory Diseases	15
1.8.4	Development	16
1.8.5	Testing.....	16
1.8.6	RAND/UCLA Appropriateness Method.....	16
1.8.7	Feasibility	16
1.8.8	Validity.....	17
1.8.9	Compliance.....	17
1.9	Overview of the Thesis Structure.....	18
CHAPTER 2 LITERATURE REVIEW		20
2.1	Introduction	20
2.2	Overview of the Prevalence of Pediatric Respiratory Diseases	20
2.2.1	Asthma	21
2.2.2	Bronchiolitis	22
2.2.3	Croup.....	24
2.3	Pediatric Respiratory Diseases in Jordan	24
2.4	Emergency Care for Respiratory Diseases	26
2.4.1	Current Management Practices in Emergency Departments.....	27
2.4.1(a)	Asthma	27
2.4.1(b)	Bronchiolitis	29
2.4.1(c)	Croup	31
2.4.2	Challenges in Emergency Department Care.	32
2.5	Quality in the Healthcare Sector	34
2.5.1	Definitions of Healthcare Quality	34

2.5.2	Dimensions of Healthcare Quality	36
2.5.3	Challenges and Barriers to Implementing Quality in Healthcare Sectors	36
2.5.4	Healthcare Quality in Jordan.....	38
2.5.5	Quality Improvement Initiatives in the Healthcare Sector.....	39
2.6	Quality Indicators (QIs)	41
2.6.1	Definitions of Quality Indicators	41
2.6.2	The Importance of Using Quality Indicators in Healthcare	43
2.6.3	Quality Indicators Used in The Emergency Departments.....	44
2.6.4	Methodologies for Developing Quality Indicators in Healthcare.....	46
2.6.5	Developed Quality Indicators Specific to Pediatric Respiratory Diseases Care in Emergency Departments.....	48
2.7	Theoretical Framework	50
2.8	Conceptual Framework	52
CHAPTER 3 RESEARCH METHODOLOGY		54
3.1	Introduction	54
3.1	Phase I: Systematic Review and Meta-Analysis	55
3.1.1	Study Design	55
3.1.2	Research Strategy (Database Details)	56
3.1.3	Study Selection Criteria	57
	3.1.3(a) Inclusion Criteria	57
	3.1.3(b) Exclusion Criteria:	57
3.1.4	Study Selection and Review.....	57
3.1.5	Data Collection and Extraction	58
3.1.6	Data Synthesis	58
3.1.7	Statistical Analysis	59
3.1.8	Risk of Bias Assessment	59

3.1.9	Protocol Registration.....	60
3.2	Phase II: Design and Development of Quality Indicators.....	60
3.2.1	Stage One: Development of Respiratory Disease Quality Indicators for Pediatric Patients in Jordanian Emergency Departments	60
3.2.1(a)	Design.....	60
3.2.1(b)	Selection of Participants	61
3.2.1(c)	Study Setting.....	62
3.2.1(d)	Study Duration.....	63
3.2.1(e)	Preliminary Work: Preparation of QIs.....	63
3.2.1(f)	Data Collection (Consensus Process)	64
3.2.1(g)	Data Analysis.....	65
3.2.2	Stage Two: Barriers and Facilitators in Implementing Quality Indicators for Pediatric Respiratory Diseases in Jordanian Emergency Departments	66
3.2.2(a)	Design.....	66
3.2.2(b)	Study Setting.....	67
3.2.2(c)	Study Duration.....	67
3.2.2(d)	Selection Criteria (Participants).....	67
3.2.2(e)	Sample Size Estimation	67
3.2.2(f)	Data Collection	69
3.2.2(g)	Pilot Test.....	71
3.2.2(h)	Data Analysis.....	72
3.3	Phase III: Evaluation of the Developed Quality Indicators.....	73
3.3.1	Stage One: Evaluation of the Feasibility of QIs and Compliance Rates in Real-World ED Settings	73
3.3.1(a)	Design.....	73
3.3.1(b)	Study Setting.....	74
3.3.1(c)	Study Duration.....	74

3.3.1(d)	Study Participants	74
3.3.1(e)	Sample Size	76
3.3.1(f)	Data collection	76
3.3.1(g)	Research Assistant (RA).....	78
3.3.1(h)	Pilot Test.....	79
3.3.1(i)	Data Analysis.....	79
3.3.2	Stage Two: Qualitative Exploration of Factors Influencing the Feasibility and Compliance of Pediatric Emergency Care QIs.....	80
3.3.2(a)	Design	80
3.3.2(b)	Study Setting.....	80
3.3.2(c)	Study Duration.....	80
3.3.2(d)	Selection Criteria (Participants).....	80
3.3.2(e)	Sample Size Estimation	81
3.3.2(f)	Data Collection	82
3.3.2(g)	Pilot Test.....	83
3.3.2(h)	Data Analysis.....	84
3.4	Ethical Considerations for All Phases	86
3.4.1	Permission to Conduct the Study	86
3.4.2	Subject Vulnerability and Harm Mitigation.....	86
3.5	Declaration of Absence of Conflict of Interest	86
3.6	Privacy and Confidentiality.....	87
3.7	Community Sensitivities and Benefits	87
3.7.1	Incentive and Reimbursement.....	87
CHAPTER 4 FINDINGS OF THE SYSTEMATIC REVIEW AND META-ANALYSIS.....		88
4.1	Introduction	88
4.2	Results	89

4.2.1	Quality Indicators of Pediatric Asthma Care in the Emergency Department; A Systematic Review and Meta-Analysis.....	89
4.2.1(a)	Search Findings	89
4.2.1(b)	Characteristics of Included Asthma Studies	91
4.2.1(c)	Domains of Existing Asthma QIs based on Donabedian and IOM Frameworks	91
4.2.1(d)	Meta-Analysis of QIs for Asthma Care in ED.....	101
4.2.1(e)	Risk of Bias Assessment.....	101
4.2.1(f)	Discussion.....	104
4.2.1(g)	Limitations	108
4.2.1(h)	Conclusion	108
4.2.2	Quality Indicators for Pediatric Bronchiolitis and Croup Care in the Emergency Department; A Systematic Review and Meta-Analysis	109
4.2.2(a)	Search Findings	109
4.2.2(b)	Characteristics of Included Studies on Bronchiolitis and Croup.....	109
4.2.2(c)	Domains of Existing QIs (Donabedian and IOM).....	111
4.2.2(d)	Meta-analysis of QIs for Bronchiolitis and Croup Care in ED	121
4.2.2(e)	Risk of Bias Assessment.....	121
4.2.2(f)	Discussion.....	124
4.2.2(g)	Limitations	128
4.2.2(h)	Conclusion	128
CHAPTER 5 FINDINGS OF THE DESIGN AND DEVELOPMENT OF QUALITY INDICATORS		129
5.1	Introduction	129
5.2	Results	129
5.2.1	Stage One: Development of Respiratory Disease Quality Indicators for Pediatric Patients in Jordanian Emergency Departments	130

5.2.1(a)	Final Selection of QIs	130
5.2.1(b)	Discussion.....	139
5.2.1(c)	Limitations.....	141
5.2.1(d)	Conclusions.....	142
5.2.2	Stage Two: Barriers and Facilitators in Implementing QIs for Pediatric Respiratory Diseases in Jordanian Emergency Departments	143
5.2.2(a)	Dimensions of Analysis.....	143
5.2.2(b)	Themes and Sub-themes for Barriers the Implementation of QIs	143
5.2.2(c)	Theme and Subthemes for Facilitating the Implementation of QIs	150
5.2.2(d)	Discussion.....	158
5.2.2(e)	Limitations.....	160
5.2.2(f)	Conclusions.....	161
CHAPTER 6 FINDINGS FROM THE EVALUATION OF THE DEVELOPED QUALITY INDICATORS.....		162
6.1	Introduction	162
6.2	Results	162
6.2.1	Stage One: Evaluation of the Feasibility of QIs and Compliance Rates in Real-World ED Settings	163
6.2.1(a)	Study Population.....	163
6.2.1(b)	Asthma QIs	164
6.2.1(c)	Bronchiolitis QIs.....	167
6.2.1(d)	Croup QIs.....	168
6.2.1	Stage Two: Qualitative Exploration of Factors Influencing the Feasibility and Compliance of Pediatric Emergency Care QIs....	170
6.2.1(a)	Factors Influencing Compliance with QIs in EDs.....	170
6.2.1(b)	Factors Influencing Documentation Practice.....	178
6.3	Discussion	185

6.4	Limitations	187
6.5	Conclusion.....	188
CHAPTER 7 CONCLUSION AND FUTURE RECOMMENDATIONS....		189
7.1	Conclusion.....	189
7.2	Strengths and Limitations of the Study	190
7.3	Recommendations Emerging from this Research	192
7.3.1	Recommendations for the Jordan MOH.....	192
7.3.2	Recommendations for the MOH hospitals	192
7.4	Recommendations for Future Research	193
7.4.1	Development of QIs based on the Best Available Informed Evidence	193
7.4.2	Include Broader Stakeholder Perspectives	194
7.4.3	Patient Involvement.....	194
7.4.4	Integrate Outcome and Structural Indicators	194
7.4.5	Further Testing of the QIs	194
7.4.6	Evaluating Long-Term Impact of QIs	195
7.4.7	Expanding Institutional Representation	195
REFERENCES.....		196
APPENDICES		
LIST OF PUBLICATIONS		

LIST OF TABLES

	Page
Table 2.1 Healthcare QIs Classified by Donabedian’s Model	43
Table 3.1 Research Strategy Used in the Literature Retrieval	56
Table 3.2 Demographic Characteristics of the Expert Panel (n=14)	62
Table 3.3 Categorization of Quality Indicators	63
Table 3.4 Definitions of Agreement and Disagreement for Different Panel Sizes	66
Table 3.5 Demographic Characteristics of the Participants (n=13)	69
Table 3.6 Interview Guide.....	71
Table 3.7 The Characteristics of the Participants.....	82
Table 3.8 Interview Guide.....	84
Table 4.1 Characteristics of Included Studies on Asthma QIs in EDs.....	92
Table 4.2 QIs of Asthma Care in ED Derived from Expert Panel Studies	93
Table 4.3 QIs of Asthma Care in ED Derived from Observational and RCT	98
Table 4.4 Risk of Bias Assessment for Included Asthma Studies	103
Table 4.5 Characteristics of Included Studies on Bronchiolitis and Croup	110
Table 4.6 QIs for Bronchiolitis and Croup in ED from Expert Panels Studies:	112
Table 4.7 QIs for Bronchiolitis and Croup in ED from Observational Studies	116
Table 4.8 Risk of Bias Assessment for Included Bronchiolitis and Croup Studies .	123
Table 5.1 Validity, Feasibility, and Consensus Outcomes for QIs	132
Table 5.2 Summary of the Final QIs Deemed Both Valid and Feasible.....	138
Table 6.1 Presents the Demographic Characteristics of the Study Participants	164
Table 6.2 Evaluation of QIs for Asthma in ED: Observation vs. Auditing	166
Table 6.3 Evaluation of QIs for Bronchiolitis in ED: Observation vs. Auditing.....	168
Table 6.4 Evaluation of QIs for Croup in ED: Observation vs. Auditing.....	169

LIST OF FIGURES

	Page
Figure 2.1 IOM Six Domains of Health Care Quality	51
Figure 2.2 Conceptual Framework.....	53
Figure 3.1 Methodological Framework.....	55
Figure 3.2 Jordan Map	74
Figure 4.1 PRISMA Flow Diagram for the Included Studies.....	90
Figure 4.2 Forest Plot of Compliance Proportions for Asthma QIs in EDs.....	102
Figure 4.3 Risk of Bias Assessment of Included Asthma Studies (JBI Tool)	102
Figure 4.4 Forest Plot for the Use of Radiography for Croup and Bronchiolitis.....	122
Figure 4.5 Forest Plot for the Use of Steroids for Croup in ED.....	122
Figure 4.6 Risk of Bias Assessment of Included Bronchiolitis and Croup Studies .	123
Figure 5.1 Process of Selecting Indicators at Different Stages of the Study.....	131
Figure 5.2 Themes and Subthemes of Barriers to the Implementation of QIs.....	144
Figure 5.3 Themes and Subthemes Facilitating the Implementation of QIs	151
Figure 6.1 Factors Influencing Compliance with QIs in ED	171
Figure 6.2 Factors Influencing Documentation Practices in the EDs	179

LIST OF SYMBOLS

Ave	Average
DEFF	Design Effect
n	Number
I^2	Heterogeneity index
m	Month
N	No
n	Number
NA	Not Applicable
q	Question
U	Unclear

LIST OF ABBREVIATIONS

AHRQ	Agency for Healthcare Research and Quality
AAP	American Academy of Pediatrics
ABC	Achievable Benchmarks of Care
ATS	American Thoracic Society
CBC	Complete Blood Count
CI	Confidence Intervals
CPG	Clinical Practice Guideline
CS	Cross-sectional
CVs	Curriculum Vitae
CXR	Chest X-Ray
DDR	Design and Development Research
ED	Emergency Department
ERS	European Respiratory Society
GINA	Global Initiative for Asthma
GP	General Practitioner
HCQI	Healthcare Quality Indicators
ICU	Intensive Care Unit
IOM	Institute of Medicine
JB	Joanna Briggs Institute
JUH	Jordan University Hospital
KAUH	King Abdullah University Hospital
LOS	Length of Stay
MAD	Mean Absolute Deviation
MeSH	Medical Subject Headings
MENA	Middle East and North Africa
MOH	Ministry of Health
NAEPP	National Asthma Education and Prevention Program
OECD	Organization for Economic Cooperation and Development
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
QIs	Quality Indicators
RA	Research Assistant
RAM	Appropriateness Method
RAND	Research and Development

RCTs	Randomized Clinical Trials
RSV	Respiratory Syncytial Virus
SABAs	Short-Acting Beta Agonists
TA	Thematic Analysis
UAE	United Arab Emirates
UCLA	University of California, Los Angeles
US	United States
WHO	World Health Organization

LIST OF APPENDICES

Appendix A	Joanna Briggs Institute (JBI) Appraisal Tools
Appendix B	Expert Review and Validation of QIs
Appendix C	Expert Panel Rating Tool
Appendix D	Subject Information Sheet and Consent Form (Phase-Two)
Appendix E	Subject Information Sheet and Consent Form (Phase Three - Quantitative Part)
Appendix F	Subject Information Sheet and Consent Form (Arabic Version – Quantitative Part)
Appendix G	Data Collection Checklist (Tool) for QIs in Field Testing
Appendix H	Subject Information Sheet and Consent Form (Phase Three - Qualitative Part)
Appendix I	Ethical Approval “JEP-EM-USM”
Appendix J	Ethical Approval and Permission Letter to Conduct the Study from the Ministry of Health in Jordan
Appendix K	Ethical Approval and Permission Letter to Conduct the Study from King Abdullah University Hospital in Jordan
Appendix L	Quality Indicators Removed in the First and Second Rounds

**PEMBANGUNAN DAN VALIDASI PENUNJUK KUALITI UNTUK
PENJAGAAN PERNAFASAN PEDIATRIK DI JABATAN KECEMASAN
JORDAN**

ABSTRAK

Penyakit respiratori pediatrik, khususnya asma, bronkiolitis dan krup, merupakan antara penyebab utama lawatan ke jabatan kecemasan di seluruh dunia. Keadaan akut ini memberikan bebanan yang besar terhadap perkhidmatan kecemasan dan memerlukan intervensi yang tepat pada masanya serta berasaskan bukti bagi memastikan kualiti rawatan yang tinggi. Pengukuran kualiti adalah penting untuk tujuan jaminan dan penambahbaikan berterusan dalam penjagaan kesihatan dan ia bermula dengan pembangunan penunjuk kualiti yang digunakan bagi menilai prestasi klinikal. Namun begitu, tiada kajian yang diterbitkan berkaitan penunjuk kualiti yang direka khusus untuk rawatan respiratori pediatrik di Jabatan Kecemasan Jordan. Kajian ini bertujuan untuk membangunkan dan mengesahkan penunjuk kualiti bagi penyakit pernafasan pediatrik di jabatan kecemasan Jordan dan telah dijalankan melalui tiga fasa yang saling berkaitan bagi memastikan proses yang sistematik dan berasaskan bukti. Kajian bermula dengan mengenal pasti penunjuk kualiti antarabangsa sedia ada untuk asma, bronkiolitis dan krup melalui kaedah sistematik dan meta-analisis. Sebanyak 255 penunjuk kualiti telah diekstrak daripada 26 kajian. Kajian-kajian ini menunjukkan pelbagai tahap bias dan tahap pematuhan terhadap penunjuk kualiti yang dikenal pasti juga berbeza mengikut sektor kesihatan. Dalam Fasa II, sejumlah penunjuk kualiti dinilai menggunakan Kaedah RAND/UCLA iaitu satu teknik konsensus berstruktur yang menggabungkan bukti saintifik dan pertimbangan pakar bagi menilai kesahan dan kebolehlaksanaan. Dua pusingan semakan oleh pakar telah

menghasilkan 26 penunjuk kualiti yang dinilai sebagai sah dan boleh dilaksanakan. Pada masa yang sama, temu bual kualitatif bersama 13 pakar dijalankan untuk meneroka halangan dan pemudah cara pelaksanaan penunjuk kualiti. Analisis tematik mengenal pasti empat tema utama halangan seperti sumber manusia dan infrastruktur. dan lima tema utama pemudah cara seperti sistem kesihatan elektronik dan sokongan pentadbiran. Fasa III menggunakan reka bentuk kaedah campuran di dua jabatan kecemasan untuk menilai kebolehlaksanaan dan pematuhan 26 penunjuk kualiti melalui pemerhatian prospektif terhadap kes asma ($n = 249$), bronkiolitis ($n = 91$), dan krup ($n = 147$), disamping semakan semula rekod perubatan. Semua penunjuk kualiti didapati boleh dilaksanakan melalui pemerhatian langsung; namun, 10 (38%) tidak boleh dilaksanakan melalui semakan rekod disebabkan dokumentasi yang tidak lengkap. Analisis pematuhan menunjukkan 52% (12 penunjuk kualiti) mencapai kadar pematuhan yang tinggi walaupun penggunaan berlebihan radiografi dan antibiotik turut diperhatikan. Komponen kualitatif fasa ini mengenal pasti dua dimensi utama: faktor yang mempengaruhi pematuhan penunjuk kualiti dan faktor yang menjejaskan dokumentasi. Ini menghasilkan lapan tema dan tujuh belas subtema, termasuk keadaan pesakit, persekitaran jabatan kecemasan dan tekanan sosial. Secara keseluruhannya, kajian ini telah menghasilkan satu set penunjuk kualiti yang sah, boleh dilaksanakan dan relevan dengan konteks jabatan kecemasan Jordan, serta menawarkan kaedah praktikal untuk menilai dan menambah baik kualiti rawatan respiratori pediatrik.

**DEVELOPMENT AND VALIDATION OF QUALITY INDICATORS
FOR PEDIATRIC RESPIRATORY CARE IN EMERGENCY
DEPARTMENTS IN JORDAN**

ABSTRACT

Pediatric respiratory diseases, particularly asthma, bronchiolitis, and croup, remain among the leading causes of emergency department (ED) visits worldwide. These acute conditions place a considerable burden on emergency services, requiring timely, evidence-based interventions to ensure high-quality care. Quality measurement is essential for both assurance and continuous improvement in healthcare and begins with the development of quality indicators (QIs) against which clinical performance can be assessed. However, no published studies have developed or adapted QIs specifically tailored to pediatric respiratory care within the context of Jordanian EDs. This study aimed to develop and validate QIs for pediatric respiratory diseases in Jordanian EDs and was conducted in three interrelated phases to ensure a systematic and evidence-based process. In Phase I, a systematic review and meta-analysis identified existing international QIs for asthma, bronchiolitis, and croup. A total of 255 QIs were extracted from 26 studies. The included studies demonstrated variable risk of bias, and compliance with the identified QIs differed considerably across healthcare sectors. In Phase II, candidate QIs were evaluated using the RAND/UCLA Appropriateness Method, a structured consensus technique integrating scientific evidence with expert judgment to assess validity and feasibility. Two rounds of expert panel review resulted in 26 QIs rated as both valid and feasible. In parallel, qualitative interviews with 13 experts explored the barriers and facilitators to QI implementation. Thematic analysis revealed four barrier themes (e.g., human resources, infrastructure)

and five facilitator themes (e.g., electronic systems, administrative support). Phase III employed a mixed methods design in two EDs to evaluate the feasibility and compliance of 26 QIs through prospective observations of asthma (n = 249), bronchiolitis (n = 91), and croup (n = 147) cases, alongside retrospective chart audits. All QIs were feasible via direct observation; however, 10 (38%) were not feasible through chart audits due to incomplete documentation. Compliance analysis showed that 52% (12 QIs) achieved high compliance, although overuse of radiography and antibiotics persisted. The qualitative component of this phase identified two key dimensions, factors influencing QI compliance and documentation practices, resulting in eight themes and seventeen subthemes, including patient condition, ED environment, and social pressure. Overall, this study produced a valid, feasible, and contextually relevant set of QIs tailored for Jordanian EDs, offering a practical tool to assess and enhance the quality of pediatric respiratory care.

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter presents an overview of the thesis by outlining the background and context of the study, with particular emphasis on pediatric respiratory diseases, emergency departments (EDs), quality of care, quality measurement, and the role of quality indicators (QIs). The chapter also provides the philosophical foundations of the study and describes the overall structure of the thesis. Furthermore, it details the problem statement, rationale, and significance of the study, defines key terms, and presents the main research objectives and questions.

1.2 Background

Respiratory diseases remain one of the most pressing global health challenges, particularly among pediatric populations (Reyes et al., 2023). These conditions are a leading cause of childhood morbidity and mortality, placing a significant burden on both families and healthcare systems (Al-Hasnawy et al., 2024; Boracchini et al., 2024). It is estimated that respiratory diseases are responsible for over 12 million child deaths annually (Khan, 2022). Beyond their profound health impact, pediatric respiratory conditions impose a substantial economic burden due to high hospitalization rates, prolonged treatment durations, and associated healthcare costs (Hu et al., 2024; Santos et al., 2024). These diseases encompass a broad spectrum of acute and chronic disorders affecting both the upper and lower respiratory tracts, ranging from mild, self-limiting symptoms to severe respiratory distress requiring emergency medical attention (Choi & Lee, 2011; Oguonu et al., 2014; Sirota et al., 2025).

Among these conditions, asthma, bronchiolitis, and croup are particularly common in childhood and frequently result in acute presentations to healthcare services (Reyes et al., 2023). Asthma, the most prevalent chronic respiratory condition in children, affects approximately 14% of the global pediatric population (Martin et al., 2022; Zar & Ferkol, 2014). Bronchiolitis, primarily of viral origin, is the leading cause of hospitalization among infants under the age of two (Milési et al., 2023). Croup, another frequent pediatric disease, accounts for a significant proportion of respiratory-related healthcare visits in young children (Garzon Mora et al., 2023). These three conditions often present with acute respiratory distress and demand timely and effective intervention to prevent complications (Bayat et al., 2023). Collectively, they contribute substantially to the volume of pediatric acute care and place additional strain on emergency services (Reyes et al., 2023).

Globally, pediatric respiratory diseases are among the leading causes of emergency department (ED) visits (Reyes et al., 2023; Richards, 2016). In the United States (US), they consistently rank among the top ten reasons for ED visits among individuals under 18, with an average of more than ten visits per 100 children (Medicine, 2007; Moorman et al., 2012). Similarly, in Australia, respiratory tract infections account for 17% to 45% of pediatric ED presentations among children under 15 years of age (Barnes et al., 2019). For example, a study from the state of Victoria reported that asthma alone accounts for approximately 3.8% of all pediatric ED presentations, ranking as the second most common reason for ED visits after injuries (Terry et al., 2023).

The burden of respiratory diseases is also notably high across the Middle East and North Africa (MENA) region (Ashrafi-Asgarabad et al., 2023). In Arab countries such as the United Arab Emirates (UAE), there is a documented reliance on EDs for

managing pediatric respiratory diseases (Mahboub et al., 2013). In Jordan, these conditions have been identified as a critical public health concern, frequently resulting in ED visits and placing significant pressure on already strained emergency services (Abu-Helalah et al., 2024; Al-Iede et al., 2022). This growing burden contributes to ED overcrowding and compromises the delivery of timely, high-quality care (Sartini et al., 2022). However, despite the apparent challenges, regional data remain limited, hindering a comprehensive understanding of the true burden across Arab countries (Mahboub et al., 2013).

EDs play a vital role in the healthcare system, acting as essential facilities for the evaluation, stabilization, and treatment of patients requiring immediate medical attention (Darraj et al., 2023; Sartini et al., 2022). Effective ED operations depend on a delicate balance of adequate staffing, appropriate facility capacity, and sufficient equipment availability to ensure the delivery of high-quality care, particularly during periods of increased patient demand (Janke et al., 2023). However, EDs globally face a range of operational challenges, with overcrowding emerging as a significant and persistent issue (Samadbeik et al., 2024). This phenomenon, often driven by rising patient volumes, places considerable strain on emergency personnel and can lead to reduced patient satisfaction (Butun et al., 2023). In addition, limited resources, staff shortages, and inconsistencies in clinical expertise further hinder the provision of safe and effective care, thereby contributing to disparities in health outcomes (Atakro et al., 2016; Chen et al., 2018).

In Jordan, although EDs are generally well equipped according to World Health Organization (WHO) guidelines, they still face several persistent challenges. These include overcrowding, inadequate equipment, limited staffing, insufficient training, prolonged waiting times, and administrative inefficiencies (Nasir, 2015).

Recent evidence also highlights infrastructural deficiencies, suboptimal ED design, constrained medical resources, and weak administrative coordination as additional barriers to effective emergency care delivery (Al-Ghabeesh et al., 2023; Zamil & Areiqat, 2022). Collectively, these challenges undermine care quality and contribute to a range of negative consequences, including poor patient outcomes, staff burnout, increased medical errors, escalating healthcare costs, treatment delays, reduced hospital capacity, extended waiting times, and a growing number of patients leaving without being seen (Samadbeik et al., 2024).

Building on the challenges facing EDs, efficient patient care, particularly in environments requiring rapid decision-making and effective resource allocation, is essential for optimizing clinical outcomes and enhancing overall healthcare system performance (Ahsan et al., 2019). Existing literature highlights considerable variability in the management of pediatric respiratory diseases in EDs, leading to inconsistent standards of care, divergent treatment approaches, variable hospitalization rates, and disparate patient outcomes (Homaira et al., 2019; Trent et al., 2019; Tyler et al., 2017). For instance, a study in the US assessed the quality of ED care for children with asthma, bronchiolitis, and croup. The findings revealed patterns of suboptimal management, including the overuse of antibiotics and chest radiography (CXR) in bronchiolitis, underuse of corticosteroids in asthma, and both inadequate corticosteroid administration and excessive CXR use in cases of croup (Knapp et al., 2008).

The quality of care is widely recognized as a cornerstone of effective healthcare systems, with substantial implications for patient safety and health outcomes (Baumbach et al., 2023; Khozanah et al., 2024). Over the past four decades, growing concerns regarding the consistency and effectiveness of care delivery have intensified global interest in healthcare quality (Atsma et al., 2020; Pap, 2022). This growing

emphasis has been driven by several factors, including increasing healthcare demand, escalating costs, the emergence of informed and empowered patients, accumulating evidence of disparities in clinical practice and access to services (Atsma et al., 2020; T, 2021; Welfare, 2021). The quality is defined as “the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge” (Agency for Healthcare Research and Quality, June 2020).

In response to growing concerns about the quality of care, quality improvement efforts have increasingly focused on evaluating professional practices by measuring healthcare delivery processes or assessing patient outcomes resulting from clinical interventions (Haya R Rubin et al., 2001). Healthcare quality measurement is typically structured around three core dimensions, structure, process, and outcome, each representing specific aspects of patient care that fall within the healthcare system’s control (Quality, 2015). These dimensions are assessed using scientifically validated tools designed to determine the extent to which children receive high-quality care through measurable components of service delivery (Agency for Healthcare Research and Quality, June 2020 ; Silva et al., 2023). Consequently, healthcare policymakers are placing increasing emphasis on the implementation of robust tools to monitor and improve hospital performance (Devkaran et al., 2019). Quality measurement has become an essential foundation for quality assurance and improvement initiatives (Quentin W, 2019). Without valid and reliable measurement frameworks, it is impossible to objectively evaluate service quality, determine the effectiveness of interventions, or detect unintended consequences of quality improvement activities (Mainz, 2004).

Among the key tools used to operationalize healthcare quality measurement are quality indicators (QIs), which are essential for evaluating specific aspects of healthcare services (Silva et al., 2023). QIs play a critical role in monitoring, assessing, and improving patient care, clinical support functions, and organizational processes that influence health outcomes (Westert GP, 2006). In ED settings, where a high-pressure and fast-paced environment can lead to variations in care, QIs are particularly valuable (K. Kocher et al., 2020). The Agency for Healthcare Research and Quality (AHRQ) define QIs as "standardized, evidence-based measures of healthcare quality that use readily available hospital inpatient administrative data to measure and track clinical performance and outcomes" (Quality, 2024). These indicators play a key role in guiding process improvements and advancing institutional performance (Puri et al., 2024).

While QIs play a vital role in performance improvement, their development must be guided by a rigorous, systematic approach rooted in high-quality scientific evidence and involve a multi-stage methodological process that ensures QIs possess several desirable characteristics (Lawrence, 1997; Mainz, 2003b; Pap, 2022). This process must also incorporate the best available evidence in combination with expert consensus) Campbell et al., 2002(. Donabedian (1988) underscored the importance of the structure, process, and outcome model in designing dependable indicators(Donabedian, 1988). Similarly, the Institute of Medicine (IOM) has consistently championed standardized quality measurement as a foundation for advancing healthcare (Medicine, 2001). Establishing and developing QIs for respiratory diseases is critical in improving healthcare quality and delivery, ultimately resulting in better patient outcomes (Karthika et al., 2021; Reyes et al., 2023; Tyler & Glasgow, 2021). QIs are also instrumental in enabling researchers, policymakers, and

healthcare providers to identify areas requiring improvement and to guide evidence-based policy development (Aaronson et al., 2015; Guttman et al., 2006).

1.3 Problem Statement

Internationally, healthcare providers and policymakers are under increasing pressure to deliver high-quality services that meet the rising expectations of patients (Renukappa et al., 2022). Improving the quality of care has become a central focus of healthcare reform efforts (Alsaedi, 2023), particularly in EDs, which serve as the frontline for acute and urgent cases (Awang et al., 2023; Cildoz et al., 2019). Nevertheless, EDs continue to grapple with enduring challenges such as overcrowding, rising patient volumes, and constrained resources, factors that significantly undermine service efficiency and patient outcomes (Beltrán Guzmán et al., 2019; Mostafa & El-Atawi, 2024). In such high-pressure environments, delivering evidence-based care remains a significant challenge (Atakro et al., 2016; Darraj et al., 2023; Suleiman et al., 2019).

Among the most common reasons for ED visits are pediatric respiratory diseases, specifically asthma, bronchiolitis, and croup (Reyes et al., 2023; Windsor et al., 2022). Despite their high prevalence and clinical significance, recent studies highlight a lack of standardized tools for evaluating the quality of care provided to children with these conditions (Reyes et al., 2023). Furthermore, significant variability persists in their management, including the overuse of diagnostic imaging and the underutilization of evidence-based treatments (Mangione-Smith et al., 2017; Parikh et al., 2014; Rivera-Sepulveda et al., 2019). For instance, a US study found that 37.5% of children with asthma received unnecessary CXRs (Rivera-Sepulveda et al., 2019), while a Korean study reported that 51.8% of children under two years old with

bronchiolitis were prescribed antibiotics despite minimal benefit (Choi & Han, 2024). These inconsistencies in practice have been associated with suboptimal outcomes and inefficiencies in pediatric emergency care (Mostafa & El-Atawi, 2024; Squires et al., 2022).

Most existing studies have focused on guideline adherence and epidemiological patterns, with quality improvement initiatives and the development of QIs largely driven by high-income countries such as the US and Australia (Hoffmann et al., 2022; Homaira et al., 2020). While international QIs provide a valuable foundation, their transferability across countries remains challenging due to variations in resources, infrastructure, and healthcare systems, with differing levels of agreement on how best to adapt them for local use (Zhu et al., 2022). A Swiss study reported that many international performance indicators lack transparency and comparability, limiting their utility across diverse healthcare systems (Adam et al., 2024). Without contextual adaptation, direct adoption of such indicators risks producing inaccurate or inapplicable results; therefore, researchers emphasize the importance of modifying existing QIs or developing new ones that are sensitive to the cultural, demographic, and structural characteristics of local health systems (Zhu et al., 2022).

The Jordan, a lower-middle-income country in the Middle East, faces rising demand for emergency services amid persistent challenges in healthcare delivery (Jawad, 2020; Nasir, 2014). Local studies have identified several problems in Jordanian EDs, including overcrowding, long waiting times, administrative inefficiencies, inadequate staffing, limited resources, and inefficiencies in triage (Nasir, 2014; Zamil & Areiqat, 2022). A recent qualitative investigation further highlighted that ED nurses encounter barriers such as poor department layout,

insufficient training, and overburdened work environments, all of which compromise the quality and timeliness of care (Al-Ghabeesh et al., 2023).

Pediatric respiratory diseases continue to impose a significant burden on the Jordanian healthcare system (Abu-Helalah et al., 2024; Al-Iede et al., 2022; Awad, Hatim, et al., 2020). There is a notable absence of unified national guidelines for the treatment of these conditions (Awad, Hatim, et al., 2020), as each healthcare sector in Jordan follows its own protocol or guideline. A survey involving 271 physicians revealed significant gaps in asthma management knowledge and clinical practice: only 67.6% of respondents demonstrated adequate knowledge of pharmacological treatment, and just 57.1% adhered to established protocols (Dahmash, 2021). Similarly, a study assessing the impact of clinical practice guideline (CPG) implementation on bronchiolitis management found a persistently high use of CXR (Awad, Hatim, et al., 2020). Additionally, a recent study in Amman reported widespread antibiotic use, despite most cases being attributed to viral respiratory infections; over 92% of hospitalized children received antibiotics (Hayek et al., 2025). These inconsistencies underscore the urgent need for systematic improvements in the organization, structure, and quality of healthcare delivery (Lugo & Pavlicich, 2013).

Although Jordan's healthcare system is often regarded as progressive relative to other countries in the region, variability in care quality remains a persistent concern (Al Balas et al., 2024). Quality measurement is fundamental to continuous improvement in healthcare (Burstin et al., 2016), and begins with the development of QIs against which clinical performance can be assessed (Pap et al., 2022). Yet, research focused on developing locally relevant QIs in Jordan, particularly within EDs, is limited. Addressing these issues is critical to systematically developing QIs that

reflect Jordan's healthcare contribute to improved quality of pediatric respiratory emergency care.

1.4 Rationale of the Study

Despite the critical role of QIs in guiding performance measurement and improving healthcare outcomes (Piekarska et al., 2025), the literature reveals a lack of standardized measures for evaluating the quality of care for pediatric asthma, bronchiolitis, and croup in emergency settings (Reyes et al., 2023). While existing international QIs provide useful frameworks, they often fail to reflect the specific clinical and operational challenges in countries like Jordan, where differences in infrastructure, resource availability, and patient demographics can undermine their applicability (Adam et al., 2024).

In Jordan, the delivery of consistent, high-quality emergency care remains a persistent challenge, exacerbated by clinical variation, overcrowded facilities, and resource constraints (Al Balas et al., 2024; Awad, Hatim, et al., 2020). Asthma, bronchiolitis, and croup are among the most encountered pediatric respiratory conditions and represent leading causes of ED visits due to respiratory distress (Bayat et al., 2023; Reyes et al., 2023). In Jordan, numerous studies have documented wide discrepancies in the diagnosis and management of pediatric respiratory conditions, such as the overuse of diagnostic imaging and antibiotics, despite evidence-based guidelines recommending otherwise (Awad, Hatim, et al., 2020; Hayek et al., 2025; Mangione-Smith et al., 2017). Their high prevalence and clinical complexity highlight the need for structured, timely emergency care guided by context specific QIs (Mangione-Smith et al., 2017; Reyes et al., 2023).

Quality measurement serves as the foundation for both assurance and continuous improvement in healthcare (Quentin W, 2019). Measurement begins with the development of QIs against which performance can be gauged (Pap, 2022), particularly in settings with high clinical variability, such as EDs.. Previous research in Jordan has demonstrated the positive impact of applying accreditation standards on service quality across several hospital domains, including patient safety, infection control, and leadership, further emphasizing the importance of structured quality frameworks (Al-Qudah & Qaoud, 2024). In EDs, the deployment of QIs is essential for evaluating the efficiency, efficacy, and safety of patient care, forming a critical component of healthcare quality management and providing a quantifiable basis for evaluating the performance of acute care services (Broccoli et al., 2018; Drynda et al., 2020; Etu et al., 2022). This underscores the need to develop context QIs tailored to pediatric respiratory care within Jordanian EDs.

Several foundational rationales drive this study. First, it addresses the lack of standardized, evidence-based practices for evaluating and improving pediatric respiratory care in Jordanian EDs. Second, it contributes to the global discourse on healthcare quality by offering a framework that can be adapted to other low- and middle-income countries. Finally, it responds to the urgent need to strengthen patient safety and improve clinical outcomes. To achieve these aims, the study systematically develops and field-tests a contextually appropriate set of QIs for asthma, bronchiolitis, and croup in Jordanian EDs, grounded in the best available evidence and expert consensus.

1.5 Significance of the Study

The current study holds significant value for clinical practice, hospital administration, national healthcare policy, and the academic field of health services research. By developing and field-testing evidence-based, locally adapted QIs for pediatric respiratory diseases in EDs, this research offers a practical tool for improving pediatric care in Jordan. The proposed QIs reflect the specific clinical realities, resource limitations, and sociocultural context of Jordanian EDs, thereby enhancing their relevance, feasibility, and potential for implementation. Beyond the local context, this work contributes to global efforts to adapt and apply quality frameworks in low- and middle-income countries and lays the groundwork for expanding these indicators to other emergency care conditions.

At the systems level, the measurement of healthcare quality is increasingly recognized as essential to improving patient outcomes, ensuring accountability, and optimizing resource utilization (McArthur et al., 2023). Al-Qudah et al. emphasized that QIs help streamline workflows, reduce medical errors, and improve patient care delivery in Jordanian hospitals (Al-Qudah & Qaoud, 2024). Developing QIs for pediatric respiratory diseases is particularly critical in healthcare facilities, especially in emergency settings where timely, consistent, and evidence-based care is essential (Hladkykh, 2024; Reyes et al., 2023). When rigorously developed and tested, QIs offer measurable benchmarks that support clinicians in evaluating diagnostic accuracy, treatment consistency, and overall quality of care (Hansen et al., 2020; Institute of Medicine Committee on Quality of Health Care in, 2001; Martin-Khan et al., 2024). Moreover, they help identify deficiencies in care processes, guide resource allocation, and reduce strain on overburdened EDs (El Miedany et al., 2023; Pap, 2022).

In addition, QIs provide hospital managers and policymakers with a structured framework for monitoring healthcare performance, assessing the effectiveness of emergency care policies, and guiding reform initiatives (Reyes et al., 2023; Zhu et al., 2022). As standardized metrics, QIs assist healthcare systems in identifying care gaps, tracking adherence to best practices, and supporting ongoing improvement initiatives (van der Linde et al., 2024). Although this study focuses on Jordan, many countries in the Middle East face similar systemic challenges, including limited resources, variation in clinical practice, and the urgent need to deliver high-quality care equitably (Hladkykh, 2024; Katoue et al., 2022). By publishing its findings and methodology, this study encourages the development of QIs that can inform quality improvement programs in neighboring countries, thereby enhancing pediatric emergency care across the region and ultimately raising overall regional healthcare standards.

1.6 Research Questions

The present study aims to answer the following research questions:

1.6.1 Phase I: Systematic Review and Meta-Analysis

- i. What QIs have been identified in the existing literature for evaluating healthcare quality for children with respiratory diseases, including asthma, bronchiolitis, and croup, in ED settings?
- ii. What are the compliance rates for these identified QIs in EDs when reported?

1.6.2 Phase II: Design and Development of Quality Indicators

- iii. Which QIs identified through the systematic review are deemed valid and feasible for implementation in Jordanian EDs?
- iv. What are the perceived barriers to and facilitators of QI implementation in ED?

1.6.3 Phase III: Evaluation of the Developed Quality Indicators

- v. What is the feasibility of the developed QIs and the compliance rate in real-world ED settings in Jordan?
- vi. What are the factors that affect the feasibility of and compliance with QIs when reported?

1.7 Research Objectives

1.7.1 General Objective

This study aims to develop and validate QIs for pediatric patients presenting with respiratory diseases to EDs in Jordan.

1.7.2 Specific Objectives

1.7.2(a) Phase I: Systematic Review and Meta-Analysis

- i. To identify existing QIs designed for ED use in pediatric patients with respiratory diseases, including asthma, bronchiolitis, and croup.
- ii. To determine the compliance rates of these identified QIs in EDs.

1.7.2(b) Phase II: Design and Development of Quality Indicators

- iii. To develop a set of preliminary QIs that are valid and feasible for use in Jordanian EDs by exploring expert panel input.
- iv. To explore the barriers and facilitators affecting QIs implementations in EDs.

1.7.2(c) Phase III: Evaluation of the Developed Quality Indicators

- v. To test the feasibility of the developed QIs and assess ED compliance with these indicators.
- vi. To explore factors influencing both the feasibility of and compliance with the QIs.

1.8 Definition of the Study Terms

1.8.1 Quality Indicators (QIs)

QIs are standardized, evidence-based measures that use available administrative or clinical data to assess healthcare performance and outcomes (Quality, 2024). They are used to quantify service delivery and evaluate whether care meets established standards, thereby supporting quality improvement efforts (Alkwai et al., 2024). In this study, QIs are operationally defined as measurable elements designed to assess the quality of pediatric respiratory care within Jordanian EDs. These indicators address key areas such as documentation of vital signs, appropriateness of diagnostic requests, and adherence to treatment protocols.

1.8.2 Emergency Department (ED)

The ED of any institution serves as the entry point for a large number of patients, handling various medical emergencies in adults and children around the clock, with emergency physicians and nurses available at all times (Pini R, 2020). In this study, the ED specifically refers to the Jordanian healthcare setting, where pediatric patients with respiratory diseases are triaged, diagnosed, and treated. The study focuses on public EDs in Jordan as the primary setting for evaluating the implementation and feasibility of QIs.

1.8.3 Pediatric Respiratory Diseases

Pediatric respiratory diseases refer to common acute respiratory conditions in children, particularly asthma, bronchiolitis, and viral croup (Reyes et al., 2023). These conditions were selected for this study due to their high prevalence in pediatric ED visits and their potential for clinical variability and mismanagement (Oguonu et al., 2014; Reyes et al., 2023; Sirota et al., 2025)

1.8.4 Development

Development refers to changes or improvements in systems, processes, or practices (Semasinghe, 2020). In this study, development is operationally defined as the systematic creation, refinement, and validation of new QIs that capture key aspects of pediatric respiratory care, adapted to clinical practices in Jordan.

1.8.5 Testing

Testing is generally defined as a means of assessing the nature, quality, or value of something (Merriam-Webster, 2025). In the context of this study, testing refers to a structured process involving pilot implementation, feasibility assessment, and compliance measurement to determine whether the developed QIs are practical and applicable in real-world emergency care settings.

1.8.6 RAND/UCLA Appropriateness Method

The RAND/UCLA Appropriateness Method is a structured, evidence-informed consensus process developed to facilitate agreement among expert panelists (Fitch et al., 2000). It combines the best available scientific evidence with clinical judgment to assess the appropriateness of a healthcare intervention, measure, or procedure. In this study, the RAND/UCLA method is operationally applied to select and validate potential QIs by guiding expert consensus on their validity and feasibility.

1.8.7 Feasibility

In quality improvement, feasibility is a key criterion for selecting QIs, as indicators must be practical to measure and implement in real-world settings (H. Rubin et al., 2001). Feasibility is operationally defined by criteria related to the applicability of the indicators and the availability of data from medical records, which are expected to contain the necessary information to determine eligibility for and adherence to the

indicators (Kottmann et al., 2024; Rizk et al., 2019; H. Rubin et al., 2001). In this study, an indicator is considered feasible if the required data are both available and can be collected with reasonable effort. Feasibility also encompasses the degree to which a QI can be practically applied in ED settings and was evaluated through expert review and field-testing phases.

1.8.8 Validity

In quality improvement, an indicator is considered valid if it is supported by scientific evidence or expert consensus and if adherence to it is expected to improve patient outcomes (Mangione-Smith et al., 2017). For indicators to serve as meaningful tools for tracking progress, they must be both measurable and valid (Larson & Mercer, 2004). In this study, validity is operationally defined as the extent to which each indicator is supported by evidence or professional consensus for evaluating pediatric respiratory care in Jordanian EDs.

1.8.9 Compliance

Compliance is defined as the extent to which healthcare providers adhere to established clinical guidelines, protocols, or recommended practices when delivering care (Niño de Guzmán et al., 2020; Ricci-Cabello et al., 2023). High levels of compliance indicate adherence to best practices, whereas low compliance may reflect implementation gaps or systemic barriers to delivering optimal care (Mogakwe et al., 2020; Shin et al., 2013). In this study, compliance is operationally defined as the degree to which healthcare professionals in Jordanian EDs follow the developed QIs for asthma, bronchiolitis, and croup. Compliance is assessed through prospective observation and analysis of documented practices in medical records, comparing these to the expected standards of care outlined in the QIs.

1.9 Overview of the Thesis Structure

The present thesis is organized into seven chapters. **Chapter 1** introduces the study by providing essential background on pediatric respiratory diseases, including their prevalence and clinical burden. It also outlines the concept of healthcare quality in emergency settings and summarizes established methods for measuring it. In addition, the chapter presents the research problem, rationale, and significance of the study, along with definitions of key terms. Finally, the main research questions and objectives are clearly outlined in this chapter.

Chapter 2 presents a comprehensive review of the literature, beginning with an overview of pediatric respiratory diseases in ED, including asthma, bronchiolitis, and croup. It explores their epidemiology, clinical presentation, and management within emergency care settings. The chapter also provides both global and local perspectives on the quality of care in pediatric emergency medicine, with a focus on the use and development of QIs. Relevant frameworks and previous studies are examined to contextualize the current study concerning QI development. The role of QIs in improving the management of pediatric respiratory diseases is also discussed in the chapter.

Chapter 3 presents the methodologies employed in this research. It begins by describing the methods used to conduct systematic review and meta-analysis. The chapter also outlines the approach used in the expert consensus process to develop a set of valid and feasible QIs, as well as the qualitative interviews conducted to explore perceived barriers and facilitators. Additionally, it details the mixed methods field-testing phase used to assess the feasibility and compliance of the QIs in Jordanian EDs. Ethical considerations related to all phases of the study are also addressed.

Chapter 4 presents the results, discussion, limitations, and conclusion of the systematic review and meta-analysis on QIs used in the ED management of pediatric asthma, bronchiolitis, and croup. It also reports on the extent of ED compliance with these indicators. **Chapter 5** presents the results, discussion, limitations, and conclusions of the expert consensus process used to develop valid and feasible QIs for pediatric respiratory care. It also includes the findings, discussion, limitations, and conclusions of the qualitative inquiry that explored perceived barriers and facilitators to QI implementation. **Chapter 6** focuses on the final phase of the study, detailing the findings, discussion, limitations, and conclusions of the mixed methods field-testing conducted to evaluate the feasibility and compliance of the developed QIs in real-world ED settings. **Chapter 7** presents the overall conclusions of the thesis, outlines the strengths and limitations of the study, and offers recommendations for future research.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter presents a comprehensive review of the literature on pediatric respiratory diseases, with a particular focus on asthma, bronchiolitis, and croup. It outlines prevalence, current clinical practices, and management strategies for these conditions in EDs, emphasizing the challenges faced in delivering effective care in ED environments. The chapter also examines the concept of healthcare quality, defining its core dimensions and discussing common barriers to implementation. Subsequently, the discussion explores the role of QIs, including their definitions, development methodologies, and their application to pediatric respiratory care in emergency settings. The chapter concludes by introducing the theoretical and conceptual frameworks that underpin this study and inform the development of the proposed QIs.

2.2 Overview of the Prevalence of Pediatric Respiratory Diseases

Acute and chronic respiratory diseases are among the most common health conditions affecting children and are significant contributors to morbidity and mortality, often requiring urgent medical attention due to the acute nature of their presentations (Khan et al., 2020; Khuhro et al., 2023). Pediatric respiratory diseases impose a significant and growing burden on healthcare systems worldwide, primarily through increased emergency visits, hospital admissions, resource demands, and associated treatment costs (Al-Hasnawy et al., 2024; Reyes et al., 2023). This burden is particularly pronounced in Middle Eastern countries, including Jordan, where rising incidence rates and limited resources place considerable strain on both patients and healthcare providers, especially in EDs (Bayat et al., 2023; Fallahzadeh et al., 2022; Khuhro et al., 2023).

While national data on the burden of pediatric respiratory diseases in Jordan remain limited, regional estimates suggest that these conditions account for up to 24.7% of pediatric hospital admissions in developing countries (Oguonu et al., 2014). This section examines the global and regional burden of pediatric respiratory diseases. Special focus is given to asthma, bronchiolitis, and croup, their prevalence, clinical features, and underlying causes, as these conditions form the clinical foundation for the QIs proposed in this study.

2.2.1 Asthma

The Global Initiative for Asthma (GINA) defines asthma as a heterogeneous lung disease characterized by chronic airway inflammation and symptoms such as wheezing, breathlessness, chest tightness, and recurrent coughing episodes ((GINA), 2024). These symptoms often vary in intensity and frequency, particularly in children, and are commonly triggered by allergens, respiratory infections, or environmental factors((GINA), 2024). Asthma is associated with both premature mortality and a reduced quality of life (Network, 2022; Societies., 2021). Historical data indicate that asthma-related mortality has been significantly higher in developing countries, while more stable trends have been observed in developed nations (Stern et al., 2020; Vos et al., 2017). Alarming, approximately 1,000 people die from asthma each day, often due to poor clinical management, the absence of individualized asthma action plans, underuse of preventive medications, and overreliance on quick-relief therapies (Reddel et al., 2015). Additionally, asthma imposes a considerable economic burden worldwide through both direct medical costs and indirect societal impacts(Yaghoubi et al., 2019). Many of these costs could be mitigated by improving access to and adherence to evidence-based treatment strategies, particularly in low- and middle-income countries (Network, 2022).

Globally, asthma affects more than 350 million people, with approximately 14% of children experiencing asthma-related symptoms (Martin et al., 2022; Vos et al., 2017; Zar & Ferkol, 2014). It commonly begins in childhood and remains one of the most prevalent chronic conditions in this age group (Network, 2022; Vos et al., 2017). Recent reports estimate that one in every 11 children is affected by asthma (Challands & Brooks, 2019). Prevalence rates vary widely across regions. In the US, a significant proportion of the pediatric population experiences recurrent asthma attacks; 2021 data show that 38.7% of individuals under 18 reported one or more asthma episodes that year (Prevention., March 29, 2023). Additionally, approximately one in twelve children aged 1 to 17 in the US is diagnosed with asthma (Zahran et al., 2018). In the European Union (EU), pediatric asthma prevalence was 9.4% (Selroos et al.). However, according to a 2024 meta-analysis of over 500,000 children and adolescents across WHO's Eastern Mediterranean Region, the highest prevalence rates were observed in Qatar (16.69%), followed by Saudi Arabia (16.57%), Iraq (16.22%), and Oman (15.20%) (Taherian et al., 2024).

2.2.2 Bronchiolitis

Bronchiolitis is an acute viral infection that primarily affects the lower respiratory tract in infants under 24 months of age (Erickson et al., 2025). Its clinical presentation ranges from mild respiratory distress to more severe forms that may progress to respiratory failure or, in rare cases, death (Bayat et al., 2023; Justice & Le, 2024). Common symptoms include dyspnea, coughing, wheezing, and, in more serious cases, hypoxia or dehydration (Ralston et al., 2014). Respiratory Syncytial Virus (RSV) is the most frequently identified causative agent, although other viral and bacterial pathogens, such as parainfluenza virus and Chlamydia trachomatis, may also be responsible (Erickson et al., 2025; Justice & Le, 2024; Kenmoe et al., 2020). The

disease follows a seasonal pattern, occurring most frequently during autumn and winter, although sporadic cases can occur throughout the year (Erickson et al., 2025).

Pediatric bronchiolitis is a significant global public health concern, placing a substantial economic burden on both families and healthcare systems (Erickson et al., 2025; Hu et al., 2024). It affects approximately one in three infants (Challands & Brooks, 2019). According to Koehoorn et al, approximately 30% of infants experience bronchiolitis before their first birthday, increasing to 90% by the age of two (Koehoorn et al., 2008). It remains one of the most common respiratory conditions leading to ED visits and hospitalizations among infants (Kaiser et al., 2022). Globally, bronchiolitis is responsible for an estimated 150 million new cases annually (Tian et al., 2023), contributing to over 3.2 million hospitalizations and approximately 59,000 deaths among children (Shi et al., 2017).

In the Middle East and Arab countries, bronchiolitis remains associated with high morbidity and mortality, with hospital admission rates continuing to rise. It is frequently reported among hospitalized infants and contributes significantly to the regional healthcare burden (Alharbi et al., 2018; Horton et al., 2017; Nair et al., 2010). A 2018 study conducted in Saudi Arabia identified bronchiolitis as the leading cause of infant hospital admissions, placing considerable strain on healthcare resources (Alharbi et al., 2018). Similarly, a 2021 study in the UAE confirmed that bronchiolitis continues to be a major cause of infant hospitalizations and is associated with substantial morbidity and mortality (Al Shibli et al., 2021). Data from Turkey and Iraq also report elevated hospitalization rates and increasing mortality, further underscoring the pressing public health implications of bronchiolitis across the region (Gökçe et al., 2017; Kadim & AL-Doori, 2020).

2.2.3 Croup

Croup, also known as laryngotracheobronchitis, is a common respiratory disease in children that affects the larynx, trachea, and bronchi (Qadir & Chaudhry, 2019; Smith et al., 2018). The condition is caused by inflammation and swelling of the upper airway mucosa, particularly in the subglottic region, which leads to partial airway obstruction and the hallmark symptoms of stridor and labored breathing (Ortiz-Alvarez, 2017; Sizar & Carr, 2025). While the majority of pediatric cases are mild and self-limiting, some may progress to severe or even life-threatening forms (Pierantoni et al., 2024; Tyler et al., 2017). Croup occurs most frequently between late autumn and early spring and is often presents at night with the abrupt onset of a barking cough, inspiratory stridor, and hoarseness (Bjornson et al., 2024).

Croup is most often caused by viral infections, with parainfluenza virus accounting for over 75% of cases, making it the leading etiological agent (Ernest & Khandhar, 2025). Other viral and bacterial pathogens may also contribute to the condition (Sizar & Carr, 2025). It remains a common upper respiratory disease in early childhood and places a significant burden on healthcare systems (Bjornson et al., 2024; Davis, 2023). In the US, croup accounts for approximately 7% of pediatric hospitalizations annually and represents nearly 15% of all respiratory-related healthcare visits in this age group (Garzon Mora et al., 2023; Smith et al., 2018).

2.3 Pediatric Respiratory Diseases in Jordan

Although global evidence provides valuable insights, it is equally important to understand how respiratory diseases specifically affect children in Jordan. Respiratory diseases place a significant burden on the healthcare system due to their high prevalence and impact (Abu-Helalah et al., 2024; Madanat et al., 2009). While several national studies have examined asthma, there remains a notable lack of research on