Quality measures for paediatric chronic illness: A literature review

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ABSTRACT

Background

The Centre for Clinical Effectiveness (CCE) received a request from an interdisciplinary team of clinical leaders from Monash Children's Hospital to conduct a systematic literature review to identify existing quality measures to assess ambulatory models of care (service delivery models) for paediatric chronic illness.

Objective

This literature review aims to identify the quality measures to assess service delivery for paediatric chronic illness.

Methods

A systematic search of articles in English from 2006 – 2015 was conducted, using Ovid MEDLINE and Google. Qualitative and quantitative systematic reviews and observational reports were included.

Studies were screened for inclusion or exclusion in consultation with colleagues, using the inclusion, exclusion and appraisal criteria established *a priori*. A narrative synthesis of the results of included studies was conducted.

Results and conclusion

This systematic literature review provided quality measurements and indicators that are used to assess care in paediatric chronic illnesses. A search of Ovid MEDLINE and Google identified 14 articles that met the inclusion criteria. The 14 articles outlined 31 resources which reported 130 quality measures and indicators. These quality measures were categorized as follows:

1. Diabetes
2. Asthma
3. Attention-deficit/hyperactivity disorder (ADHD)
4. Mental health
5. Clinical depression
6. Sickle cell treatment
7. Paediatric hospitalizations and chronic care
8. Melanoma
9. Blood lead toxicity
10. Special health care needs
11. HIV/AIDS
12. Substance use/abuse
13. Heart
14. Obesity
15. Pressure ulcer
16. Coeliac disease
17. Epilepsy
18. Hepatitis B
19. Eczema
20. Long-term prescribing
21. Family experiences with care
22. Patient reported outcomes (Health outcomes and patent experiences of care)

For each main category outlined above, there were be up to 20 different more specific measures with operational definitions provided. Sources of these definitions are also listed, in Table 2.

Recommendations

Select quality measure categories that are most relevant to the services provided by Monash Health and then select a more specific measure from Table 2 or any that are closely aligned to the desired outcomes.

Background

The Centre for Clinical Effectiveness (CCE) received a request from an interdisciplinary team of clinical leaders from Monash Children's Hospital to conduct a systematic literature review to identify existing quality measures to assess ambulatory models of care (service delivery models) for paediatric chronic illness.

Objective

This literature review aims to identify existing quality measures to assess ambulatory models of care (service delivery models) for paediatric chronic illness. Research evidence was reviewed to select quality indicators potentially relevant to children and dealing with the prioritized clinical area of chronic disease.

Review questions

What are the quality measures applicable to the care of paediatric patients with chronic illnesses?

Methods

Inclusion criteria

Population	**Inclusion:**	Children (up to 18 years old) diagnosed with paediatric chronic illnesses (e.g. asthma, cystic fibrosis, diabetes, obesity, malnutrition, developmental disabilities, cerebral palsy, consequences of low birth weight, and mental illness). Families and carers of children with paediatric chronic illness.
	Exclusion:	Others.
Outcomes	**Inclusion:**	Quality measures (clinical-based, patient-based, family-based and management-based), not limited to: • Health-related quality of life (HRQoL) domain scores • Clinical measures • Psychosocial factors • Work absenteeism (security of parental employment) • School absenteeism • Financial implications for the family • Travel (e.g. interstate). • Other measurable indicators.
	Exclusion:	Others.
Setting	**Inclusion:**	Hospital-diagnosed paediatric chronic illnesses.
	Exclusion:	None.
Publication Details	**Inclusion:**	Qualitative and quantitative research papers and organizational reports.
	Exclusion:	Other study designs, non-English publications and animal studies.
Publication Date		2006 – Present (13 January 2015).
Databases searched	Ovid MEDLINE and Google.	

Search strategy

A comprehensive search strategy was used for the literature review, as detailed in Appendix I. Published records in English that fulfilled the inclusion criteria were systematically searched in Ovid MEDLINE and Google for inclusion, while employing the date limits from 2006 - current (13 January 2015). Modified block building was used to accommodate differences in search terms, indexes and thesaurus across the electronic databases. Thirdly, the

reference lists of all included peer-reviewed articles were searched for additional studies. Searches of medical databases were screened by one reviewer in consultation with colleagues and the authors of records were contacted for further details, where necessary.

Risk of bias

The methodological quality of included studies was not assessed.

Results

Study selection

The database search identified 336 records. When a screening decision could not be made based on title and abstract alone, full-text for records was retrieved. As shown in Figure 1, 14 studies were included in the review.

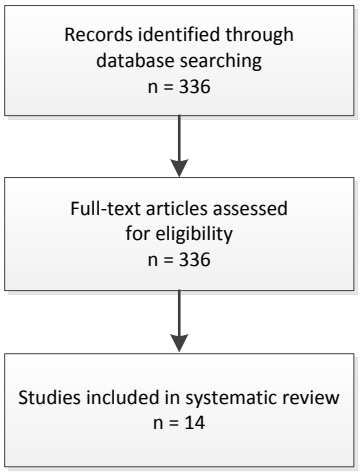

Figure 1. Study selection process

These 14 studies were a mixture of primary and secondary research studies that identified paediatric chronic illness quality measures from 31 resources. These resources included Children's Health Insurance Program Reauthorization Act (CHIPRA), Agency for Healthcare Research and Quality (AHRQ), Centres for Medicare and Medicaid Services (CMS) and Healthcare Effectiveness Data and Information Set (HEDIS), as shown in Table 1 below. All the listed resources were published in the United States (US), saved for the National Association of Children's Hospitals and Related Institutions (NACHRI), which is a group of children's hospitals with more than 200 members in the US, Australia, Canada, Italy, Mexico and Puerto Rico.

Table 1. Sources for paediatric chronic illness quality measures

Sources
AHRQ United States Health Information
AHRQ-CMS CHIPRA Paediatric Measurement Centre of Excellence (PMCoE)
American Medical Association : Physician Consortium for Performance Improvement (AMA :PCPI)
Bridges to Excellence (BTE) Asthma Clinician Guide and Measures
Centre of Excellence for Paediatric Quality Measurement (CEPQM)
Centre of Excellence on Quality of Care Measures for Children with Complex Needs (COE4CCN)
CHIPRA Initial Core Set of Children's Health Care Quality Measures
Child and Adolescent Health Measurement Initiative (CAHMI)
Children's Hospital of Philadelphia (CHOP)
CMS
Consumer Assessment of Healthcare Providers and Systems (CAHPS)
Collaboration for Advancing Paediatric Quality Measures (CAPQuaM)
Health Resources and Services Administration (HRSA)
Institute of Medicine and National Research Council (IOM-NRC)
Illinois Department of Healthcare and Family Services
Institute for Clinical Systems Improvement (ICSI)
Joint Commission on the Accreditation of Healthcare Organizations (JCAHO)
Maine CHIPRA Quality Demonstration Grant, Improving Health Outcomes for Children (IHOC)
Medicaid Encounter Data Driven Improvement Core Measure Set (MEDDIC-MS)
Maternal and Child Health Bureau (MCHB)
Medicaid Encounter Data Driven Improvement Core Measure Set (MEDDIC-MS)
NACHRI
National Quality Measures Clearinghouse (NQMC)
National Committee on Quality Assurance (NCQA) HEDIS Measures
National Heart, Lung & Blood Institute (NHLBI)
National Collaborative for Innovation in Quality Measurement (NCINQ)
NCQA's National Quality Forum-endorsed Measures (NQF)
Paediatric Quality Measures Program (PQMP)
Quality Measurement, Evaluation, Testing, Review, and Implementation Consortium (Q-METRIC)
State of Alabama
Substance Abuse and Mental Health Services Administration (SAMHSA)

Outcome results

This review provided 130 quality measurements and indicators that are used to assess care in paediatric chronic illnesses. From the quality measures and indicators of the included documents, 22 main categories were reported. These were categorized as follows:

1. Diabetes
2. Asthma
3. Attention-deficit/hyperactivity disorder (ADHD)
4. Mental health
5. Clinical depression
6. Sickle cell treatment
7. Paediatric hospitalizations and chronic care
8. Melanoma
9. Blood lead toxicity
10. Special health care needs
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Table 2. Quality measures for the management of paediatric chronic illness

For each main category in Table 1, operational definitions are provided alongside the sources of these definitions.

S/N	Quality measures	Operational definitions (Numerator/Denominator)	Sources
1. DIABETES			
1.1	Diabetes annual paediatric haemoglobin (HbA1c) testing	**Numerator:** Number of patients in the denominator sample who have documentation of date and result for the most recent HbA1c test during the 12-month reporting period. **Denominator:** A systematic sample of patients, ages 5-17 years with a diagnosis of diabetes and/or notation of prescribed insulin/oral hypoglycemic / antihyperglycemics for at least 12 months. This is defined by documentation of a face-to-face visit for diabetes care between the physician and patient that predates the most recent visit by at least 12 months.	NCQA (IHOC[1]) NQF (IHOC[1]) IOM-NRC[2] NCQA HEDIS[3] CHIPRA (Illinois DOH 2014[4]) State of Alabama (Mangione-Smith 2011[5])
1.2	Diabetes care	Percentage of patients with Type 1 or Type 2 diabetes with at least one HbA1c test conducted in the measure look back period by age cohort-birth to 17 years and 18 to 75 years.	MEDDIC-MS (CMS[6])
1.3	Diabetes care	At least one LDL test in the look-back period.	MEDDIC-MS (CMS[6])
1.4	Diabetes short term complication admission rate	Number of patients admitted for diabetes short-term complications (ketoacidosis, hyperosmolarity, coma) per 100,000 population.	AHRQ (CMS[6])
1.5	Diabetes short-term complication admission rate	Number of admissions for diabetes short-term complications per 100,000 population.	AHRQ (CMS[6])
1.6	Diabetes long-term complication admission rate	Number of admissions for long-term complications per 100,000 population.	AHRQ (CMS[6])
1.7	Uncontrolled diabetes admission rate	Number of admissions for uncontrolled diabetes per 100,000 population.	AHRQ (CMS[6])

1.8	Rate of lower-extremity amputation among patients with diabetes	Number of admissions for lower-extremity amputation among patients with diabetes per 100,000 population.	AHRQ (CMS[6])
1.9	Lipid profile	Percentage of patients with Type 1 or Type 2 diabetes with a lipid profile.	NCQA HEDIS[3] MEDDIC-MS (CMS[6])
1.10	Eye exam	-	NCQA HEDIS[3]
1.11	Documented evidence of glucose assessment	Children newly presenting with polydipsia, polyuria, and/or weight loss should have clearly documented evidence of glucose assessment.	Gill 2014[7]
1.12	Offered annual influenza immunisation	Children with Type 1 diabetes aged ≥6 months should have documented evidence of being offered annual influenza immunisation.	Gill 2014[7]
2. ASTHMA			
2.1	Asthma medication management for people with asthma	**Numerator:** a) CHIPRA: Number of children in the denominator who remained on asthma medications for the measurement year for at least 50 percent of their treatment period and 2) at least 75 percent of their treatment period. b) Meaningful use: Number of patients in the denominator who were appropriately prescribed controller medication during the measurement year. c) Pathways to excellence: Number of children in the denominator who were appropriately prescribed controller medication within the last 12 months. **Denominator:** a) CHIPRA: Members 5-20 years of age who were identified as having persistent asthma and who were dispensed appropriate medications. Also calculate rates for age stratifications: 5-11, 12-18, 19-20 and 5-20. b) Meaningful use: Patients age 5 to 64 years of age with persistent asthma and a visit during measurement year. Also calculate rates for age stratifications 5-11, 12–-18 and 19-64. c) Pathways to excellence: Children between the ages of 2 and <19 years who have been under the care of the participating practice for at least 24 months and have a documented diagnosis of persistent asthma.	NCQA HEDIS[3] AHRQ[8] CHIPRA (IHOC[1]) BTE (IHOC[1])
2.2	Asthma influenza vaccination	**Numerator:** Number of children in the denominator who had a flu shot within the last 12 months. **Denominator:** Number of children with asthma between the ages of 2 and <19 years who have been under the care of the participating practice for at least 24 months.	BTE (IHOC[1]) NHLBI Guideline (IHOC[1])
2.3	Asthma patient self-management plan	**Numerator:** Number of children in the denominator with a written asthma action plan updated within the past 12 months. **Denominator:** Number of children with asthma between the ages of 2 and <19 years who have been under the care of the participating practice for at least 24 months.	BTE (IHOC[1]) NHLBI Guidelines (IHOC[1])
2.4	Asthma tobacco exposure and use	**Numerator:** Number of children in denominator: a) Ages 2 and <19 years with documentation of tobacco exposure and; b) Ages 10 and <19 years assessed for tobacco use within the last 12 months. **Denominator:** Number of children with asthma between the ages of 2 and <19 years who have been under the care of the participating practice for at least 24 months.	BTE (IHOC[1])

2.5	Asthma patient body mass index (BMI)	**Numerator:** Number of children in denominator who have evidence of BMI percentile documentation within the last 12 months. **Denominator:** Number of children between the ages of 2 and <19 years who have been under the care of the participating practice for at least 24 months and have a documented diagnosis of asthma.	BTE (IHOC[1])
2.6	Asthma annual percentage of asthma patients with one or more asthma-related emergency room (ER) visits	**Numerator:** Number of children in the denominator who had at least 1 ER visit(s) during the measurement year (March 1 through February 28th) where the primary diagnosis assigned on the claim was asthma. **Denominator:** Number of children age 2 - <21 years diagnosed with asthma during the measurement year.	NQF#1381 (IHOC[1]) IOM-NRC[2] NCQA HEDIS[3] State of Alabama (Mangione-Smith 2011[5])
2.7	Rate of emergency department visit use for children managed for persistent asthma	Number of visits to the emergency department by children who are being managed for persistent asthma. Date and number of all emergency visits with a primary or secondary diagnosis of asthma. The denominator represents the person time (calculated monthly in child-months) contributed by children ages 2—21 who meet the criteria for persistent asthma for that month's assessment period and have been continuously enrolled in the index plan for at least 2 consecutive months immediately preceding the reporting month..	CAPQuaM (AHRQ[8]) PQMP (AHRQ[8])
2.8	Distribution of emergency department visit use for children managed for persistent asthma	Two count measures and two distributions. The counts are the number of unique children age 2-21 who meet the criteria for persistent asthma and the number who have at least one visit to the emergency department. The distributions are: the distribution of the number of Emergency Department (ED) visits that each child who contributed to the numerator had; and the number of months that each child in the numerator contributed to the numerator.	CAPQuaM (AHRQ[8]) PQMP (AHRQ[8])
2.9	Primary care connection prior to ED visits for children with identifiable asthma	Evidence of connection to the primary care medical system prior to first ED visit and / or hospitalization that has a primary or secondary diagnosis of asthma among children whom our specifications identify with asthma. All first ED visits and / or hospitalizations, in which asthma was a primary or secondary diagnosis, identified using the specifications provided in Section II, in children who are eligible because they meet the criteria for identifiable asthma and have been enrolled for the 6 consecutive months prior to the ED visit/admission.	CAPQuaM (AHRQ[8]) PQMP (AHRQ[8])
2.10	Primary care connection after emergency department visits for asthma	Visit(s) to a primary care provider that occurred within 14 days following the ED visit 2. Visit(s) to a primary care provider that occurred within 30 days following the ED visit 3. Have at least one fill of an asthma controller medication within 2 months after the ED visit (including the day of visit). All ED visits in which asthma was a primary or secondary diagnosis identified using the specifications provided in Section II, in children who are continuously enrolled for at least the 2 months following the ED visit.	CAPQuaM (AHRQ[8]) PQMP (AHRQ[8])
2.11	Appropriateness of ED visits for children and adolescents with identifiable asthma	The numerator is defined as the number of denominator events that also satisfy at least one of the explicit appropriate use criteria and are in the random sample. The denominator represents a random sample of the patients in each age stratum (age 2-5, 6-11, 12-18, and, optionally, 19-21 years) who have visited the emergency department for asthma (as a first or second diagnosis) and meet the specified criteria for having identifiable asthma.	CAPQuaM (AHRQ[8]) PQMP (AHRQ[8])
2.12	Return to ED within 48 hours following inpatient discharge for asthma	Return to the ED within 48 hours following discharge - same diagnosis	JCAHO (CMS[6])
2.13	Low acuity asthma readmission rate	Rate of readmission for asthma less than 15 days after discharge.	JCAHO (CMS[6]) NACHRI (CMS[6])

2.14	Asthma admission rate	Number of patients admitted for asthma per 100,000 population.	AHRQ (CMS[6])
2.15	Children's asthma care	Unplanned readmission (ED, observation status or inpatient admission) for asthma within 7 days following discharge from the hospital for asthma – same diagnosis.	JCAHO (CMS[6])
2.16	Children's asthma care	Unplanned readmission (ED, observation status or inpatient admission) for asthma within 30 days following discharge from the hospital for asthma – same diagnosis.	JCAHO (CMS[6])
2.17	Children's asthma care	Return to hospital (ED, observation status or inpatient admission) with same asthma diagnosis within 7 days following Emergency Room visit or observation stay.	JCAHO (CMS[6])
2.18	Children's Asthma Care	Return to hospital (ED, observation status or inpatient admission) with same asthma diagnosis within 30 days following Emergency Room visit or observation stay.	JCAHO (CMS[6])
2.19	Children's Asthma Care	Use of relievers for inpatient asthma by American Board of Paediatrics age groups.	JCAHO (CMS[6])
2.20	Children's Asthma Care	Use of systemic corticosteroids for inpatient asthma by American Board of Paediatrics age groups.	JCAHO (CMS[6])
2.21	Children's Asthma Care	Risk adjusted length of stay for asthma patients.	JCAHO (CMS[6])
2.22	Children's Asthma Care	Home management plan of care discussed with patient/family.	JCAHO (CMS[6])
2.23	Documented basis for diagnosis	Children with asthma aged ≤5 years should have a clearly documented basis for diagnosis.	Gill 2014[7]
2.24	Spacer prescription	Children with asthma should be prescribed a spacer.	Gill 2014[7]
2.25	Annual review with documented height	Children with asthma should have an annual review with documented height.	Gill 2014[7]
2.26	Asthma exacerbation	Children and young people admitted or seen in secondary care for an asthma exacerbation should be assessed within 30 days in primary care.	Gill 2014[7]
3. ADHD			
3.1	ADHD follow-up care for children prescribed with ADHD medication (e.g. stimulant medication treatment)	**Numerator:** Initiation Phase: Number of children in the denominator who had at least one follow-up visit with a prescribing practitioner within 30 days after the initiation of medication. Continuation Phase: Number of children in the denominator who had at least two follow-up visits with a prescribing practitioner within the 9 month period after the 30 day Initiation Phase. **Denominator:** Number of children 6-12 years of age at the start of medication, with an ambulatory prescription dispensed for ADHD medication, who remained on the medication for at least 10 months after starting treatment. A variation by AHRQ: Patients who attended at least one ADHD follow-up care visit within the calendar year. All patients aged 4 through 18 years with a diagnosis of ADHD.	IOM-NRC[2] CHIPRA (IHOC[1]) NCQA/HEDIS (IHOC[1] and Mangione-Smith 2011[5]) NQF #0108 (IHOC[1]) AHRQ[8] ICSI (CMS[6])
3.2	ADHD follow-up care, continuation and maintenance	Percentage of children 6—12 years of age as of the Index Prescription Episode Start Date with an ambulatory prescription dispensed for an ADHD medication who remained on the medication for at least 210 days and who in addition to the visit in the Initiation Phase had at least two	NCQA (CMS[6])

		additional follow-up visits with a practitioner within 270 days (9 months) after the Initiation Phase ends	
3.3	Accurate ADHD diagnosis	Patients whose diagnosis of ADHD was based on a clinical exam with a physician that included clinical practice guideline recommended assessment using a validated tool, confirmation, or direct assessment of the patient. All patients ages 4 through 18 years with a diagnosis of ADHD.	AHRQ[8]
3.4	Behaviour therapy as first-line treatment for preschool-aged children with ADHD	Patients for whom ADHD-focused evidence-based behaviour therapy was prescribed as first-line treatment. All patients aged 4 through 5 years with a diagnosis of ADHD.	AHRQ[8]
3.5	Stimulant medication for ADHD treatment	Stimulant medication for the treatment of ADHD should not be initiated by GPs	Gill 2014[7]
4. MENTAL HEALTH			
4.1	Children who receive needed mental health care	-	CAHMI (AHRQ[8])
4.2	Follow-up after hospitalization for mental illness	**Numerator:** Number of children in the denominator with an outpatient visit, intensive outpatient encounter, or partial hospitalization with a mental health practitioner within: a) 7 days after discharge b) 30 days after discharge **Denominator:** Number of children age 6 to < 21 years who were hospitalized for treatment of selected mental health disorders and discharged. Continuous enrolment date of discharge through 30 days after discharge.	CHIPRA (IHOC[1]) NCQA HEDIS[3] (IHOC[1] and Mangione-Smith 2011[5]) NQF #0576 (IHOC[1]) MEDDIC-MS (CMS[6])
4.3	Follow-up visit for children and adolescents on antipsychotics	One or more follow-up visits with a practitioner with prescribing authority, within 30 days of the date on which a new antipsychotic prescription was dispensed. Children age 1 to 20 years with a new prescription of an antipsychotic medication during the measurement year.	NCINQ (AHRQ[8])
4.4	Use of first-line psychosocial care for children and adolescents on antipsychotics	Documentation of psychosocial care during the 121-day period from 90 days prior to the date on which a new antipsychotic prescription was dispensed to 30 days after the date on which a new antipsychotic prescription was dispensed. Children age 1 to 20 years with a new prescription of an antipsychotic medication during the measurement year.	NCINQ (AHRQ[8])
4.5	Metabolic screening for children and adolescents newly on antipsychotics	One or more tests for blood glucose and one or more tests for cholesterol in the 106-day period from 90 days prior to 15 days after the new start of an antipsychotic medication. Children age 1 to 20 years with a new prescription of an antipsychotic medication during the measurement year.	NCINQ (AHRQ[8])
4.6	Metabolic monitoring for children and adolescents on antipsychotics	At least one test for blood glucose or HbA1c and at least one test for LDL-C or cholesterol in the 106 day period from 90 days prior to 15 days after the new start of an antipsychotic medication during the measurement year. Children age 1 to 20 years who have had two or more antipsychotic medications dispensed on separate dates of service during the measurement year.	NCINQ (AHRQ[8])
4.7	Use of multiple concurrent antipsychotics in children and adolescents	Those on two or more concurrent antipsychotic medications for at least 90 days during the measurement year. Children age 0 to 20 years on any antipsychotic medication during the measurement year, with at least 3 months of continuous health plan eligibility for medical and pharmacy benefits. Age stratification: 0-5 years, 6-11 years, 12-17 years, 18-20 years.	NCINQ (AHRQ[8])
4.8	Safe and judicious antipsychotic use in children and adolescents	Received two or more antipsychotic medication prescriptions with higher than recommended doses. Children age 1 to 20 years on an antipsychotic medication during the measurement year, with at least 3 months of continuous health plan eligibility for medical and pharmacy benefits. Age	NCINQ (AHRQ[8])

		stratification: 0-5 years, 6-11 years, 12-17 years, 18-20 years.	
4.9	Use of antipsychotic medications in very young children	Those on any antipsychotic medication during the measurement year. Children age 1 to 5 years during the measurement year. Age stratification: Less than 2 years, 2-3 years, 4-5 years.	NCINQ (AHRQ[8])
4.10	Community based mental health services (CMHS) child consumer outcome measures for discretionary service programs child or adolescent/caregiver combined	Tool to assess the outcomes of clients in all SAMHSA-funded programs to improve services for people with mental and addictive disorders. Domains assessed include functioning, stability in housing, education, perception of care, social connectedness, reassessment status and discharge services	SAMHSA (CMS[6])
5. CLINICAL DEPRESSION			
5.1	Screening for clinical depression	**Numerator:** Number of those in the denominator who were screened for clinical depression using a standardized tool, with follow up plan documented. **Denominator:** Number of patients 12 years of age and older	CMS[6] (IHOC[1]) CHIPRA (IHOC[1]) NQF #0418 (IHOC[1]) Federal ACO #18 (IHOC[1])
5.2	Diagnostic evaluation	Percentage of patients whose depressive symptoms were adequately assessed for the presence of major depressive disorder during the initial visit.	AMA:PCPI (CMS[6])
5.3	Suicide risk assessment	Percentage of patients with major depressive disorder who had a suicide risk assessment completed at each visit.	AMA:PCPI (CMS[6])
5.4	Severity classification	Percentage of patients whose severity of major depressive disorder was classified at the initial visit.	AMA:PCPI (CMS[6])
5.5	Treatment: Psychotherapy, medication management, and/or electroconvulsive therapy	Percentage of patients with major depressive disorder who received therapy appropriate to their classification.	AMA:PCPI(CMS[6])
5.6	Child and adolescent major depressive disorder	Suicide risk assessment.	Mangione-Smith 2011[5]
5.7	Antidepressant medications	Antidepressant medications should not be initiated by GPs for children and young people with depression.	Gill 2014[7]
6. SICKLE CELL DISEASE (SCD) TREATMENT			
6.1	Appropriate outpatient blood testing	Children who had a pulse oximetry reading, complete blood count, and reticulocyte count as part of outpatient care; 3 rates will be reported, one for each test type. Children ages 0 to 5 who have SCD.	Q-METRIC (AHRQ[8]) NQMC (AHRQ[8])
6.2	Anticipatory guidance for pain management	Children who received anticipatory guidance regarding the prevention and/or management of pain as part of outpatient care during the measurement year. Children identified as having SCD.	Q-METRIC (AHRQ[8]) NQMC (AHRQ[8])
6.3	Anticipatory guidance for prevention of severe fever and infection	Children who received anticipatory guidance regarding the prevention and/or management of fever and severe infection as part of outpatient care during the measurement year. Children identified as having SCD.	Q-METRIC (AHRQ[8]) NQMC (AHRQ[8])
6.4	Anticipatory guidance for the prevention of stroke	Children who received anticipatory guidance regarding identification, prevention and/or management of stroke/silent infarcts as part of outpatient care during the measurement year. Children identified as having SCD	Q-METRIC (AHRQ[8]) NQMC (AHRQ[8])

6.5	Anticipatory guidance regarding school attendance	Children who received anticipatory guidance regarding school attendance as part of outpatient care during the measurement year. Children identified as having SCD.	Q-METRIC (AHRQ[8]) NQMC (AHRQ[8])
6.6	Anticipatory guidance for prevention of splenic complications	Children who received anticipatory guidance regarding the prevention and/or management of splenic complications as part of outpatient care during the measurement year. Children identified as having SCD.	Q-METRIC (AHRQ[8]) NQMC (AHRQ[8])
6.7	Anticipatory guidance regarding hydroxyurea treatment	Children who received anticipatory guidance regarding the risks and benefits of treatment with hydroxyurea as part of outpatient care during the measurement year. Children identified as having SCD.	Q-METRIC (AHRQ[8]) NQMC (AHRQ[8])
6.8	Haemoglobin B (HgB) S monitoring at time of transfusion (chronic transfusion)	Children who received monitoring of HgB S levels at the time of each transfusion. Children identified as having SCA who received transfusion(s).	Q-METRIC (AHRQ[8]) NQMC (AHRQ[8])
6.9	Appropriate ED blood testing	Children who had a pulse oximetry reading, complete blood count, reticulocyte count, and blood culture within 60 minutes of initial contact. Four rates will be reported, one for each test type. Children identified as having SCD who presented to the ED with fever.	Q-METRIC (AHRQ[8]) NQMC (AHRQ[8])
6.10	Appropriate ED fever management	Children who received parenteral broad-spectrum antibiotic treatment within 60 minutes of initial contact. Children identified as having SCD who presented to the ED with fever.	Q-METRIC (AHRQ[8]) NQMC (AHRQ[8])
6.11	Appropriate ED pain assessment	Children who had a pain assessment within 30 minutes of initial contact. Children identified as having SCD who presented to the ED with an acute pain episode during the measurement year.	Q-METRIC (AHRQ[8]) NQMC (AHRQ[8])
6.12	Appropriate ED pain management	Children who had parenteral analgesic within 60 minutes of initial contact, and a pain assessment within 30 minutes of analgesic administration. Two rates will be reported, one for administration and one for follow-up assessment. Children identified as having SCD who presented to the ED with severe pain during the measurement year.	Q-METRIC (AHRQ[8]) NQMC (AHRQ[8])
6.13	Satisfaction with hematologist care	Parents who respond Agree or Strongly Agree to the question, Over the past 12 months, I have been satisfied with the overall care from my child's haematologist. Parents of children with SCD.	Q-METRIC (AHRQ[8]) NQMC (AHRQ[8])
6.14	Satisfaction with ED care	Parents who respond Agree or Strongly Agree to the question, Over the past 12 months, I have been satisfied with the overall care my child received in the ED. Parents of children with SCD.	Q-METRIC (AHRQ[8]) NQMC (AHRQ[8])
6.15	Timeliness of confirmatory testing for SCD	Number of children receiving confirmatory testing for SCD and communication of those results. Two rates will be reported. The denominator is drawn from all SCD cases reported in a State's newborn screening program records within the measurement year.	Q-METRIC (AHRQ[8]) NQMC (AHRQ[8])
6.16	Timeliness of antibiotic (penicillin) prophylaxis for children with SCD	The number of eligible children who received appropriate antibiotic prophylaxis within 90 days of age. The eligible population is drawn from all SCD cases reported in State NBS program records.	Q-METRIC (AHRQ[8]) NQMC (AHRQ[8])
6.17	Appropriate antibiotic prophylaxis for children with SCD	Number of children ages 3 months through 4 years with SCD, continuously enrolled in Medicaid, who during the measurement year received preventive antibiotics for at least 300 days, and at least 350 days. The number of children ages 3 months through 4 years with SCD, who were continuously enrolled in Medicaid during the measurement year.	Q-METRIC (AHRQ[8]) NQMC (AHRQ[8])
6.18	Transcranial doppler ultrasonography	The number of children ages 2 through 15 years of age with SCD who were continuously enrolled in Medicaid and who received TCD	Q-METRIC (AHRQ[8])

	screening for children with SCD	ultrasonography during the measurement year. The number of children ages 2 through 15 years of age with SCD who were continuously enrolled in Medicaid during the measurement year.	NQMC (AHRQ[8])
6.19	Sickle cell anemia readmission rate	Rate of readmission for sickle cell less than 30 days after initial discharge home.	NACHRI (CMS[6]) JCAHO (CMS[6])
7. PAEDIATRIC HOSPITALIZATIONS AND CHRONIC CARE			
7.1	Paediatric all-condition readmission	Hospitalizations at general acute care hospitals for patients less than 18 years old that are followed by one or more readmissions to general acute care hospitals within 30 days. Hospitalizations at general acute care hospitals for patients less than 18 years of age.	CEPQM (AHRQ[8])
7.2	Lower respiratory infection readmission measure	Hospitalizations at general acute care hospitals for LRI in patients less than 18 years of age that are followed by one or more readmissions to general acute care hospitals within 30 days. Hospitalizations at general acute care hospitals for LRI in patients less than 18 years of age. Does not include mental health admissions or well newborns.	CEPQM (AHRQ[8])
7.3	Hospitalization rate: Chronic conditions rate	Age and gender adjusted population based rate of hospitalization for chronic conditions only per 1000 enrolees age 0-14.	CAHMI (CMS[6])
7.4	PICU unplanned readmission rate	Percentage of patients requiring unscheduled readmission to the ICU within 24 hours of discharge or transfer.	NACHRI (CMS[6])
7.5	PICU standardized mortality ratio	Percentage of patients under the age of 18 years who died in the PICU and were admitted to the ICU for greater than 2 hours and had at least 2 consecutive sets of vitals signs consistent with life.	NACHRI (CMS[6])
7.6	PICU severity-adjusted LOS	Number of PICU days between PICU admission and PICU discharge.	NACHRI (CMS[6])
7.7	PICU medication safety practices	Documentation of all 5 aspects of adoption of PICU safety practices.	NACHRI (CMS[6])
7.8	PICU pain assessment on admission	Percentage of patients who were assessed for pain on admission to the PICU.	NACHRI (CMS[6])
7.9	PICU periodic pain assessment	Percentage of patients who are assessed for pain at a minimum of every 6 hours.	NACHRI (CMS[6])
7.10	Paediatric medical complexity algorithm	-	COE4CCN (AHRQ[8])
7.11	Management plan for chronic care	Proportion of children with a chronic health problem who have a current management plan. The primary care team should work with the patient's family to specifically develop a management plan that includes visit schedules and communication strategies.	Bruner 2008[9] Chen 2012[10]
7.12	Document counseling about nutrition	The primary care team should document counselling about nutrition when a child's BMI is more than or equal to 85 percentile for age and gender or note a reason for not doing so.	Chen 2012[10]
8. MELANOMA			
8.1	Patient history	Percentage of patients with either a current diagnosis of melanoma or a history of cutaneous melanoma.	AMA:PCPI (CMS[6])
8.2	Complete physical skin examination	Percentage of patients with either a current diagnosis of melanoma or a history of cutaneous melanoma who had a complete physical skin exam performed at least once within 12 months.	AMA:PCPI (CMS[6])
8.3	Counselling on self-examination	Percentage of patients with either a current diagnosis of melanoma or a history of cutaneous melanoma who were counselled, at least once within 12 months, to perform a self-examination for new or changing moles.	AMA:PCPI (CMS[6])

9. BLOOD LEAD TOXICITY			
9.1	Blood lead toxicity screening: Age one and two years	Percentage of children age 6 to 16 months and 17 to 28 months at the date of service who had a blood lead screening test performed.	MEDDIC-MS (CMS[6])
9.2	Lead screening in children	Percentage of children two years of age who had one or more capillary or venous lead blood tests for lead poisoning by their second birthday.	NCQA (CMS[6])
9.3	Childhood lead test screening	Percentage of children with 3rd birthday during the measurement year with a blood test for elevated blood lead levels.	HRSA (CMS[6])
10. SPECIAL HEALTH CARE NEEDS			
10.1	Children with special health care needs module	Survey-based methods and tools designed to identify children with special health care needs and measure the basic aspects of health care quality domains including: access to prescription medications; access to specialized services; family-centered care; and coordination of care.	CAHPS (CMS[6]) CAHMI (CMS[6])
10.2	Medical home	Percentage of children with special health care needs who receive coordinated, ongoing, comprehensive care within a medical home.	CAHMI (CMS[6]) MCHB (CMS[6])
11. HIV/AIDS			
11.1	Paediatric measure	Percentage of paediatric patients prescribed prophylactic therapy according to immunologic status.	HRSA (CMS[6])
11.2	Paediatric measure	Percentage of paediatric patients assessed for adherence to antiretroviral therapy in the past four months.	HRSA (CMS[6])
11.3	Paediatric measure	Percentage of paediatric patients with at least one paediatric HIV specialist visit in the past four months.	HRSA (CMS[6])
11.4	Paediatric measure	Percentage of paediatric patients with viral load test in the past four months.	HRSA (CMS[6])
11.5	Paediatric measure	Percentage of paediatric patients with appropriate ARV therapy management.	HRSA (CMS[6])
12. SUBSTANCE USE/ABUSE			
12.1	Tobacco use and help with quitting among adolescents		NCINQ (AHRQ[8])
13. HEART			
13.1	Paediatric heart surgery mortality	Number of in-hospital deaths in patients undergoing surgery for congenital heart disease per 100 patients	AHRQ[8] CMS[6]
13.2	Paediatric heart surgery volume		AHRQ[8]
14. OBESITY			
14.1	BMI documentation	Number of children 2 through 18 years of age who came in for a well-child visit in the measurement period month and who were classified based on BMI percentile for age and gender.	NICHQ (CMS[6])
14.2	BMI	Percentage of children, ages 2 to 5 years, receiving WIC services that have a BMI at or above the 85th percentile.	HRSA (CMS[6])
15. PRESSURE ULCER			
15.1	Decubitus ulcer	Number of patients with decubitus ulcer per 1,000 eligible admissions (population at risk).	AHRQ (CMS[6])
16. COELIAC DISEASE			

16.1	Serological testing for coeliac disease	Children with chronic or intermittent diarrhoea and/or faltering growth should be investigated with serological testing for coeliac disease.	Gill 2014[7]
17. EPILEPSY			
17.1	Referral to secondary care	Children with a first non-febrile seizure should have clearly documented evidence of referral to secondary care for further assessment	Gill 2014[7]
18. HEPATITIS B			
18.1	Hepatitis B risk	Children eligible for targeted hepatitis B immunisation should have a complete and up-to-date immunisation record.	Gill 2014[7]
19. ECZEMA			
19.1	Prescribed emollients	Children with atopic eczema should be prescribed emollients.	Gill 2014[7]
19.2	Topical steroids	Percentage of children who have a repeat prescription of moderate/very potent topical steroids.	Gill 2014[7]
19.3	Atopic eczema with suspected eczema herperticum	Children with atopic eczema with suspected eczema herperticum should be referred urgently for further assessment.	Gill 2014[7]
20. LONG-TERM PRESCRIBING			
20.1	Annual review	Children on long-term prescriptions should have an annual review in primary care.	Gill 2014[7]
20.2	Documented monitoring	Children taking methylphenidate, atomoxetine or dexamfetamine should have clearly documented monitoring.	Gill 2014[7]
21. FAMILY EXPERIENCES WITH CARE			
21.1	HEDIS CAHPS Medicaid version 3.0/4.0 including supplemental items for children with chronic conditions (click the link here)	31-questions that supplement the CAHPS child survey version 3.0/4.0 Medicaid and commercial core surveys, that enables health plans to identify children who have chronic conditions and assess their experience with the health care system.	HEDIS (Mangione-Smith 2011[5]) CAHPS (Mangione-Smith 2011[5]) NCQA (Mangione-Smith 2011[5]) Co 2011[11] CMS[6]
21.2	CAHPS clinician and group survey for primary care practitioners participating in Medicaid and CHIP	Patient experience of care survey of quality of care for outpatient paediatric patients.	CAHPS (Mangione-Smith 2011[5]) AHRQ CMS[6]
21.3	Parent's report of HRQoL	HRQoL domains of physical functioning, emotional functioning, social functioning, school functioning, cognitive functioning and psychosocial functioning.	Distelberg 2014[12]
21.4	Days of school missed (over 30 days)		Distelberg 2014[12]
21.5	Days too sick to play		Distelberg 2014[12]
21.6	Impact childhood illness scale (ICIS)	The ICIS is a self-administered questionnaire used to assess the impact of infantile illness on parents. It was created to investigate the feelings of epileptic children's parents but the authors suggest its use also with other chronic illnesses, because none of the items specifically mentions this pathology. Each of the 30 items investigates at the same time two	Epifanio 2013[13]

		dimensions: the frequency of a problem and the degree of the parenting concerns that it causes. For both dimensions a Likert scaling method (never, sometimes, often) is used. The items are divided in 4 sections, which respectively investigate: i) the impact of the illness and its treatment; ii) the impact on the growth and the child's adaptation; iii) the impact on the parents; iv) the impact on the family. The total score (range 0-60) is the sum of the four sections scores and of the two dimensions (30 for each one). High scores indicate a high frequency of problems perceived by parents and of an high concerns that they cause.	
21.7	Parenting stress index-SF (PSI-SF)	The PSI-SF is the short version of the Parenting Stress Index 2, 25, 26 a greatly used test to value the parenting stress. In the test, the parent expresses the degree of agreement/disagreement with the 36 statements (answer in a Likert scale of 5 points). The test uses three factors to measure parenting stress, to which correspond the three subscales: i) the scale of parenting Distress (PD): it defines the level of distress which a parent lives in his parenting role, understood as derived from personal factors directly linked to this role; ii) the scale of the dysfunctional Interaction parent-child (P-CDI): it values the parenting perception of a child not responding to his expectations and of an interaction with the child neither reinforcing nor rewarding; iii) the scale of the Difficult Child (DC): it values how much the parent perceives his child as easy/difficult to manage, basing on some of his behavioural characteristics. The total score, obtained by the sum of the scores at the 3 subscales, can be interpreted as a stress index related to the only parenting role, in its three sub-dimensions (an higher score indicates a greater perceived stress). The critical cut-off to indicate a clinically significant stress, both for the global scale and for the three subscales, is 85%. The test includes also a Defensive Responding scale, useful to control the validity of the protocol, which indicates if the parent tends to give a better self-image, playing down the problems and the perceived stress in the relationship with the child (score ≤10).	Epifanio 2013[13]
22. PATENT EXPERIENCES OF CARE (INCLUDING HEALTH OUTCOMES)			
22.1	Paediatric global health	The PGHM metric is a scale score—i.e., a single number that represents an individual's level of global health. For reporting purposes, we recommend calculation of mean values (or other measures of central tendency and dispersion) for a given group. Thus, the numerator will be the sum of measure scores across all individuals in a group. For mean scores, the denominator is the sum of the number of individuals in the target population.	CHOP (AHRQ[8])
22.2	Adolescent assessment of preparation for transition (ADAPT) to adult-focused health care	The ADAPT survey measures the quality of health care transition preparation for youth with chronic health conditions, based on youth report of whether specific recommended processes of care were received. Responses from a survey sample derived from a clinical program or health plan are summarized in 3 domain-level composite scores. ADAPT composite scores are calculated using the summation of positive responses to between 3 and 5 individual items. For survey items within each composite score, the *denominator* is the number of respondents for whom the item is scored as 0 or 1.	CEPQM (AHRQ[8])
22.3	Consumer assessment of healthcare providers and systems hospital survey—child version (Child HCAHPS)	The numerator is all individuals who return a completed survey. The denominator for the survey is all patients who meet the following criteria: (1) Parents of children <18 years old; (2) Admission includes at least one overnight stay in the hospital; (3) Non-psychiatric MS-DRG / principal diagnosis at discharge; (4) Alive at time of discharge.	CEPQM (AHRQ[8])
22.4	Transition from paediatric-focused to adult-focused health care	Within each composite score, the numerator is the number of respondents with a positive response (item score of 1). For survey items within each composite score, the denominator is the number of respondents for whom the item is scored as 0 or 1.	CEPQM (AHRQ[8])
22.5	Child report on HRQoL	HRQoL domains of physical functioning, emotional functioning, social functioning, school functioning, cognitive functioning and psychosocial functioning.	Distelberg 2014[12]

Table 3. Illinois' child core set measures performance – CY2009-CY2012 dashboard[4]

The Illinois Department of Healthcare and Family Services developed the CHIPRA core set of children's healthcare quality measures for Medicaid and CHIP in 2014. Table 3 shows an example of how these child core set measures are used in the dashboards.

Child Core Set Measure	CY2009	CY2010	CY2011	CY2012
HPV Vaccine for Female Adolescents	N/A	N/A	N/A	12.3
BMI Assessment for Children/Adolescents				
3 to 11 Years	0.4	0.6	0.8	1.3
12 to 17 Years	0.4	0.6	0.8	1.3
3 to 17 Years	0.4	0.6	0.8	1.3
Children and Adolescents' Access to Primary Care Practitioners				
12 to 24 Months	87.8	87.8	88.1	86.1
25 Months to 6 Years	79.5	78.6	78.6	76.7
7 to 11 Years	80.3	81.1	80.1	80.1
12 to 19 Years	78.2	80.0	79.5	79.3
All Age Groups	80.5	81.0	80.5	79.7
Childhood Immunization Status				
Combo 2	65.0	64.2	66.4	67.6
Combo 3	59.1	59.2	61.2	63.1
Combo 4	N/A	N/A	N/A	28.4
Combo 5	N/A	N/A	N/A	49.5
Combo 6	N/A	N/A	N/A	30.6
Combo 7	N/A	N/A	N/A	23.7
Combo 8	N/A	N/A	N/A	16.1
Combo 9	N/A	N/A	N/A	25.8
Combo 10	N/A	N/A	N/A	14.0
Immunization Status for Adolescents				
Meningococcal	23.9	34.0	43.1	49.8
Tdap	30.6	39.5	47.6	54.9
Combo (Meningococcal/Tdap)	18.1	27.0	35.9	43.3
Frequency of Ongoing Prenatal Care				
<21% of expected visits	11.4	11.1	10.9	4.8
21 – 40% of expected visits	6.7	6.5	6.5	4.0
41 – 60% of expected visits	11.2	10.7	10.6	4.5
61 – 80% of expected visits	21.9	21.3	21.1	6.0
>81% of expected visits	48.9	50.3	51.0	80.7
Timeliness of Prenatal Care	54.1	55.6	58.1	50.2
Percentage of Live Births Weighing Less Than 2,500 Grams	8.9	8.6	8.7	8.5
Cesarean Rate for Nulliparous Singleton Vertex	N/A	22.7	23.4	23.5
Developmental Screening in the First 3 Yrs of Life				
1 Year	43.7	52.6	60.8	63.5
2 Years	32.2	41.0	49.7	53.5
3 Years	19.5	27.0	34.7	38.5
Total	31.9	40.0	48.1	51.5

Based on CY2009-CY2012 Data and 2013 HEDIS® Percentiles

90th percentile or greater (or inverted measure, 10th percentile – lower score denotes better performance)

75th percentile

50th percentile

25th percentile

10th percentile

No percentile available for comparison or rate is not at least the 10th percentile

N/A – Not Available

Child Core Set Measure	CY2009	CY2010	CY2011	CY2012
Annual Pediatric Hemoglobin (HbA1c) Testing	N/A	N/A	N/A	72.6
Well Child Visits in the First 15 Months of Life				
0 Visits	3.2	2.6	2.6	2.9
1 Visit	2.7	2.4	2.2	2.5
2 Visits	3.7	3.2	3.1	3.5
3 Visits	5.0	4.6	4.5	4.5
4 Visits	7.1	6.7	6.4	6.3
5 Visits	10.3	9.8	9.2	8.7
6 or More Visits	68.1	70.8	72.0	71.7
Well Child Visits in the Third, Fourth, Fifth and Sixth Years of Life				
3 Years	74.1	74.2	74.3	72.1
4 Years	74.7	74.7	74.6	72.0
5 Years	79.0	77.9	77.4	74.8
6 Years	58.2	58.1	57.7	56.1
Total	71.7	71.4	71.2	68.8
Adolescent Well Care Visits	40.7	41.5	41.8	42.0
Chlamydia Screening in Women				
16-20 Years	44.7	46.9	45.6	43.8
21-24 Years	52.5	55.2	55.7	52.8
Total	48.3	50.7	50.2	47.8
Percent of Eligibles Who Received Preventive Dental Services (FFYs 2010-2013)	50.3	52.1	53.2	52.1
Percent of Eligibles Who Received Dental Treatment Services (FFYs 2010-2013)	21.3	21.6	22.5	21.2
Medication Management for People with Asthma: ≥50% Days Covered				
5 – 11 Years	N/A	N/A	N/A	41.6
12 – 18 Years	N/A	N/A	N/A	36.8
19 – 20 Years	N/A	N/A	N/A	33.0
5 – 20 Years	N/A	N/A	N/A	39.7
Medication Management for People with Asthma: ≥75% Days Covered				
5 – 11 Years	N/A	N/A	N/A	19.4
12 – 18 Years	N/A	N/A	N/A	16.7
19 – 20 Years	N/A	N/A	N/A	18.7
5 – 20 Years	N/A	N/A	N/A	18.4
Follow-up After Hospitalization for Mental Illness				
7 Days	27.6	32.0	31.5	32.5
30 Days	46.3	51.8	51.2	55.2
Follow-up Care for Children Prescribed Attention Deficit Hyperactivity Disorder (ADHD) Medication				
Initiation Phase	24.6	31.7	32.1	33.6
Continuation & Maintenance Phase	26.1	36.1	39.3	38.3

Child Core Set Measure	CY2009	CY2010	CY2011	CY2012
Appropriate Testing for Children with Pharyngitis	41.7	43.3	46.8	49.7
Annual Percentage of Asthma Patients with One or More Asthma-related Emergency Room Visits	17.5	17.8	18.4	12.3
Ambulatory Care – Emergency Department Visits (Per 1,000 Member Months)				
<1 Year	102	94	95	95
1 – 9 Years	57	50	51	49
10 – 19 Years	36	32	32	31
Total	50	44	44	42

Child Core Set Measure	CY2009	CY2010	CY2011	CY2012

Based on CY2009-CY2012 Data and 2013 HEDIS® Percentiles

90th percentile or greater (or inverted measure, 10th percentile – lower score denotes better performance)

75th percentile

50th percentile

25th percentile

10th percentile

No percentile available for comparison or rate is not at least the 10th percentile

N/A – Not Available

Macey 2010 systematically reviewed the literature and evaluate the structure and function of paediatric observation units in the US. Standard dashboard outcome measures were proposed, as reported in Table 4.

Table 4. Suggested dashboard measures for paediatric observation units[14]

	ED →	OU →	Inpatient →	Clinic
Length of stay*	ED arrival to OU admission	OU admit to disposition	Inpatient admit to discharge	
	ED arrival to discharge home from OU			
	ED arrival to discharge from inpatient following OU care			
	OU admission to discharge home from inpatient care			
Admission*	% ED census admitted inpatient	% OU census admitted		
	% ED census that is observed			
Unscheduled return visits*	To ED	Requiring OU admission	Requiring inpatient admission	
Scheduled follow-up*	To ED			To primary care or subspecialist office
Capacity	ED crowding scales		Unable to accept transfers	
	ED left before evaluation rates		Inpatient occupancy	
	Ambulance diversion			
Satisfaction		Patient/Parent		
	ED providers	OU providers	Inpatient providers	Follow-up providers
Cost	ED care	OU care	Inpatient care	
		Total encounter		

Abbreviations: ED, emergency department; OU, observation unit.
*Condition-specific measurement should be considered. *For same diagnosis at 72 hours, 1 week, and 30 days

Discussion

We identified quality measures surrounding paediatric chronic illnesses from peer-reviewed and non-peer reviewed agency reports. These quality measures assist to standardize reporting and assess the quality of paediatric chronic care in healthcare systems. A further evaluation of these quality indicators is recommended for feasibility and reliabilty, by expert review panels, using assessment tools such as the RAND appropriateness method.[7]

Limitations

The search for studies was conducted in online Ovid MEDLINE and Google only. Other published and grey literature databases may provide more sources of quality measures.

Conclusions

This systematic literature review provided quality measurements and indicators that are used to assess care in paediatric chronic illnesses. A search of Ovid MEDLINE and Google identified 14 articles that met the inclusion criteria. The 14 articles outlined 31 resources which reported 130 quality measures and indicators. These quality measures were categorized as follows:

1. Diabetes
2. Asthma
3. Attention-deficit/hyperactivity disorder (ADHD)
4. Mental health
5. Clinical depression
6. Sickle cell treatment
7. Paediatric hospitalizations and chronic care
8. Melanoma
9. Blood lead toxicity
10. Special health care needs
11. HIV/AIDS
12. Substance use/abuse
13. Heart
14. Obesity
15. Pressure ulcer
16. Coeliac disease
17. Epilepsy
18. Hepatitis B
19. Eczema
20. Long-term prescribing
21. Family experiences with care
22. Patient reported outcomes (Health outcomes and patent experiences of care)

For each main category above, operational definitions are provided alongside the sources of these definitions.

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Appendix I: Search strategies (13 January 2015)

Databases	Records
Ovid MEDLINE	42
Google (no date limits) Quality measure ambulatory model of care service delivery p?ediatric children chronic illness	294
Total records	**336**

Search terms in Ovid MEDLINE		
#	**Terms**	**Records**
1	exp Quality Indicators, Health Care/	13487
2	exp Ambulatory Care/	45607
3	model of care.mp.	2073
4	service delivery.mp.	6868
5	p?ediatric.mp. or exp Pediatrics/	222268
6	children.mp. or exp Child/	1702008
7	chronic illness.mp. or exp Chronic Disease/	224565
8	2 or 3 or 4	54340
9	5 or 6	1756272
10	measure.mp.	328236
11	assess*.mp.	1918476
12	1 or 10 or 11	2154662
13	7 and 8 and 9 and 12	43

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