NCC Pediatrics Continuity Clinic Curriculum:
Choosing Wisely: High-Value Medical Decisions
Faculty Guide

Goals & Objectives: *From ChoosingWisely® Key Principles:*

- Learn to order tests and prescribe medications based on best evidence.
- Learn to use effective communication techniques to explain and reassure patients about why we are or are not recommending certain treatments.
- Appreciate the obligation to our patients, profession and society to be responsible stewards of medical resources.

Pre-Meeting Preparation:

- "We Can Teach How to Bend the Cost Curve: Lessons in Pediatric High-Value Health Care" (*Pediatrics*, 2017)
- Read the AAP Choosing Wisely Lists
- Read "AAP: Ten Things Physicians & Patients Should Question"; "SHM-PHM: Five Things Physicians & Patients Should Question"
- "Use of low-value pediatric services in the Military Health System" (*BMC HSR*, 2020) Conference

Conference Agenda:

- Review "Choosing Wisely" Quiz
- Complete "Choosing Wisely" Discussion Questions

Extra-Credit:

- "2023 Update on Pediatric Medical Overuse" *(Pediatrics 2023)*
- "Use of low-value pediatric services in the Military Health System" *(BMC Health Services Research, 2020)*
- "Trends in Low-Value Care Among Children's Hospitals" (*Pediatrics, 2024)*
- "Overuse of medical care in paediatrics: A survey from 5 countries in the European Academy of Pediatrics" *(Frontiers in Peds, 2022)*
- For those on **Twitter**, check out **#choosingwisely**

Helpful Tools

- healthcarebluebook.com *(requires registration)*
- cost.sidecarhealth.com
- fairhealthconsumer.com
- https://www.communitymed.org/cost-estimator
- High-Value Care Pediatric Curriculum *(MedEd Portal, 2015. Thorough resource with articles, powerpoint lectures, case examples, geared toward residents)*

We Can Teach How to Bend the Cost Curve: Lessons in Pediatric High-Value Health Care

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"We have really good data that show when you take patients and you really inform them about their choices, patients make more frugal choices. They pick more efficient choices than the health care system does."

Donald Berwick, MD

In continuing the series of articles by the Council on Medical Student Education in Pediatrics, we focus on the great clinical teacher's responsibility to both deliver and explicitly teach about high-value health care. Medical students entering clinical rotations have been introduced to the concept of "too much care" in their coursework, including overdiagnosis, overtreatment, excessive testing, and poor care coordination and communication.[1,2] As pediatricians committed to eliminating practices and associated expenditures that are not evidence-based and that lack direct patient benefit, we can improve our clinical teaching skills by making our role-modeling of such behaviors explicit. This paper reviews ways to incorporate teaching about common examples of pediatric care of limited or no value by using accessible teaching tools, such as the Choosing Wisely lists.[3] We also introduce 2 efficient teaching aids to help learners incorporate the concept of value into their clinical reasoning and presentations: Prepare, Process, Initiate (PPI), and Subjective, Objective, Assessment, Plan, Value (SOAP-V).[4]

EXCESSIVE COSTS OF HEALTH CARE IN THE UNITED STATES: PROPORTION FROM "TOO MUCH CARE"

Despite the modest deceleration in the rate of rise in total US health care expenditures over the last few years, health care spending in the United States vastly exceeds spending in other developed nations, yet our health outcomes are worse.[5] The societal impact is substantial: health care indebtedness is the leading cause of household bankruptcy, and increasing health insurance premiums have eliminated real growth in wages for the past 2 decades.[6,7] "Too much" care also comes at a personal cost to patients and families, including side effects from unneeded medications and complications from unnecessary procedures.

Approximately half of excess health care cost due to various categories of "waste" in the health care system falls into domains that are under the control of physicians.[2] These include failures of care delivery and coordination, and wasteful excessive care in the form of overdiagnosis, overtesting, and overtreatment. Although pediatrics is not typically viewed as a source of excessive

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costs, significant opportunities for value improvement in pediatrics exist, and pediatric costs are rising faster than costs in adult health service delivery.[8,9] Many students who complete pediatric rotations eventually pursue other specialties, but the principles of high-value care are readily transferable.

WHY TEACH ABOUT HEALTH CARE VALUE?

Given the excessive costs in US health care and their effects on patients and families, value and quality require more explicit emphasis in our pediatric teaching. Traditional clinical reasoning instruction results in the generation of extensive and frequently exhaustive differential diagnoses for common presenting complaints. This can have the unintended effect of teaching students and residents that no diagnostic possibility should go unexplored.[10] Although limiting premature diagnostic closure and ensuring consideration of an accurate differential diagnosis are critical, sound clinical reasoning is also compatible with the teaching of restraint, stepwise decision-making, plans that avoid excess, and the incorporation of patient and family perspectives. When exploring clinical reasoning of learners, we can ask them to explain both the utility and the risks of tests they would like to order.[5,10] Clinical teachers should explain the complexity, work, and unintended consequences of potential false positive results , even for what seem like "simple" tests. Although students who accurately identify a rare diagnosis receive praise, we rarely reward those who arrive at appropriate assessments with limited testing and consultation, or those who are comfortable with the uncertainty of waiting for the first round of limited testing to return, or observing a patient for a few days to see if improvement occurs. Noting and praising these behaviors more frequently could, over time, move our training culture toward high-value care.[4,10]

TOOLS FOR TEACHING HIGH-VALUE CARE

Choosing Wisely is a public education campaign whose purpose is to begin conversations between patients and physicians about potentially unnecessary tests and treatments. It highlights specific targets for improving value in pediatric primary care, inpatient, nursery, and select subspecialty settings, providing an excellent starting point for teaching basic pediatric high-value care. Pediatricians should have familiarity with these recommendations and potentially post them in their workrooms, or on course Web sites for easy access by learners and for use in teaching. These resources, which include references and evidence supporting all recommendations, are available at: www.choosingwisely.org.

Clinical teachers should role model honest conversations with families about current evidence-based decision-making, calculated risks versus benefits, and areas of uncertainty in clinical knowledge and practice. By doing so, they engage patients and parents in shared decision-making, and patients will often choose the less invasive, less aggressive approach.[11]

PPI AND SOAP-V MODELS FOR CLINICAL ENCOUNTERS

PPI is a newly proposed and practical approach for teaching learners to apply the concepts of high-value care in pediatrics. Before a patient encounter, oral presentation, or before writing a note, the preceptor communicates with the learner using the following tool:

"Prepare": What are the benefits versus harms of testing, interventions, and treatments related to the presenting problem, in general, but also, more specifically, to this particular patient?

"Process": What evidence exists pertaining to the presenting problem and the proposed interventions?

"Initiate": Of the interventions available, which ones will maximize benefit, minimize harm, and be least costly? Here, preceptors emphasize to learners that patients and parents should share in this decision-making.

See Table 1 for examples of how the PPI model applies to common pediatric conditions.

SOAP-V adds "value" to the traditional Subjective-Objective-Assessment-Plan presentation by incorporating 3 value elements in the framing of management plans.[4] Ask students to include answers to these questions when presenting a plan: (1) Does adding my proposed intervention potentially change management? Does it meaningfully benefit the patient? (2) Have I incorporated patient and family values and circumstances, and considered potential harms? (3) What is known about the cost of the intervention, both immediately and downstream?

VALUE AND ETHICS

Lessons on the principle of nonmaleficence (primum non nocere) are abundantly available in the teaching of high-value care. Although the bioethical principle of beneficence has led some to believe that cost should never be a consideration in treatment decisions, Schroeder and Ralston[18] have recently illustrated how the bioethical principle of parsimony entreats us to effectively diagnose and treat each patient in the most efficient manner possible, with the efficient approach containing the most benefit for the patient.

TABLE 1 Using PPI To Teach Value

Setting	Example	Prepare	Process	Initiate
Office	Parents of a thriving 4-mo-old infant ask if she needs medications for her "reflux."	Could acid suppressing medication help? Are there harms?	Systematic review of articles on acid suppression harms and Choosing Wisely show no benefit and increased risk of infections.[3,12]	Reassure family that spit-up is normal if growth is fine; come to shared decision not to use medication.
Office	An immunized 18-mo-old child has a normal neurologic exam and a viral exanthem after a simple febrile seizure.	Does this child need more work-up for seizures? Is there potential harm from a CT scan?	AAN/AAP guideline and Choosing Wisely: no EEG or head imaging needed. Consider potential harms of radiation, sedation, inadvertent findings.[3,13]	Empathize with family on how frightening this was, but explain how it is also common and the absence of long-term effects. Counsel what to do if there is a recurrence.
Office	A low-risk, 120-h-old, 41-wk gestation girl has a serum bilirubin of 20.1 mg/dL. Mother reports her milk is in, and baby has gained 20 g since the previous day.	Should we initiate phototherapy? Are there side effects to phototherapy, such as impact on bonding?	Measured level is below the AAP guideline phototherapy line; NNT in this category is >3000.[14,15]	Discuss risks/harms of phototherapy and treatment alternatives, such as a repeat bilirubin level the next day and continued frequent breastfeeding in a comfortable home setting.
ED	A 3-y-old girl presents with minor closed head injury after falling off a trampoline. She had no LOC and 2 episodes of emesis.	What is this child's risk of a TBI that needs neurosurgical intervention? What are the harms of a CT scan in terms of radiation, sedation, and costs?	PECARN study risk calculation shows intermediate (0.8%) TBI risk.[16]	Shared decision-making with family on options of observing for a few more hours in the ED for worsening symptoms versus risks of sedation and incidental findings on imaging.
Inpatient	A 6 y old initially admitted for peripheral IV antibiotics for acute hematogenous osteomyelitis is now afebrile, clinically improved, and has a significant decline in C-reactive protein.	By what route should additional antibiotics be administered? What are the costs of PICC lines (including placement, risk of clots, infection, mechanical complications) versus oral antibiotics (including concerns about compliance).	Large study showing equivalent cure rates for oral and IV antibiotics, but with higher risks for IV antibiotics administered at home via PICC after discharge.[17]	Shared decision-making with family; they opt for discharge on an oral agent with weekly follow-up.

AAN, American Academy of Neurology; AAP, American Academy of Pediatrics; CT, computed tomography; ED, emergency department; IV, intravenous; PECARN, Pediatric Emergency Care Applied Research Network; PICC, peripherally inserted central catheter; TBI, traumatic brain injury.

CONCLUSIONS

With almost half of excess health care costs related to decision-making at the clinician level, opportunities to teach the incorporation of high-value care at the level of the clinical encounter are plentiful. Clinical teachers can bend the health care cost curve downward by teaching and role modeling high-value care. The tools presented in this article can help clinical teachers structure lessons in high-value care in daily clinical encounters. Highlighting the underlying bioethical principles and giving thoughtful consideration of options while meeting the best interests of patients and families will assist in incorporating the concept of value in clinical reasoning and medical decision-making. Great clinical teachers are well positioned to demonstrate in both practice and teaching how "doing less" in appropriate situations is safe, family-centered, evidence-based, and ethical.

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ABBREVIATIONS

PPI: Prepare, Process, Initiate
SOAP-V: Subjective, Objective, Assessment, Plan, Value

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How This List Was Created

The American Academy of Pediatrics (AAP) employed a three-stage process to develop its list. Using the Academy's varied online, print and social media communication vehicles, the first stage invited leadership of the Academy's 88 national clinical and health policy-driven committees, councils and sections to submit potential topics via an online survey. The second stage involved expert review and evaluation of the management groups that oversee the functions of the committees, councils and sections. Based on a set of criteria (evidence to document unproven clinical benefit, potential to cause harm, over-prescribed and utilized, and within the purview of pediatrics) a list of more than 100 topics was narrowed down to five. Finally, the list was reviewed and approved by the Academy's Board of Directors and Executive Committee.

AAP's disclosure and conflict of interest policy can be found at www.aap.org.

Choosing Wisely®

An initiative of the ABIM Foundation

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

Five Things Physicians and Patients Should Question

1 Antibiotics should not be used for apparent viral respiratory illnesses (sinusitis, pharyngitis, bronchitis).

Although overall antibiotic prescription rates for children have fallen, they still remain alarmingly high. Unnecessary medication use for viral respiratory illnesses can lead to antibiotic resistance and contributes to higher health care costs and the risks of adverse events.

2 Cough and cold medicines should not be prescribed or recommended for respiratory illnesses in children under four years of age.

Research has shown these products offer little benefit to young children and can have potentially serious side effects. Many cough and cold products for children have more than one ingredient, increasing the chance of accidental overdose if combined with another product.

3 Computed tomography (CT) scans are not necessary in the immediate evaluation of minor head injuries; clinical observation/Pediatric Emergency Care Applied Research Network (PECARN) criteria should be used to determine whether imaging is indicated.

Minor head injuries occur commonly in children and adolescents. Approximately 50% of children who visit hospital emergency departments with a head injury are given a CT scan, many of which may be unnecessary. Unnecessary exposure to x-rays poses considerable danger to children including increasing the lifetime risk of cancer because a child's brain tissue is more sensitive to ionizing radiation. Unnecessary CT scans impose undue costs to the health care system. Clinical observation prior to CT decision-making for children with minor head injuries is an effective approach.

4 Neuroimaging (CT, MRI) is not necessary in a child with simple febrile seizure.

CT scanning is associated with radiation exposure that may escalate future cancer risk. MRI also is associated with risks from required sedation and high cost. The literature does not support the use of skull films in the evaluation of a child with a febrile seizure. Clinicians evaluating infants or young children after a simple febrile seizure should direct their attention toward identifying the cause of the child's fever.

5 Computed tomography (CT) scans are not necessary in the routine evaluation of abdominal pain.

Utilization of CT imaging in the emergency department evaluation of children with abdominal pain is increasing. The increased lifetime risk for cancer due to excess radiation exposure is of special concern given the acute sensitivity of children's organs. There also is the potential for radiation overdose with inappropriate CT protocols.

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Five More Things Physicians and Patients Should Question

6

Don't prescribe high-dose dexamethasone (0.5mg/kg per day) for the prevention or treatment of bronchopulmonary dysplasia in pre-term infants.

High-dose dexamethasone (0.5 mg/kg day) does not appear to confer additional therapeutic benefit over lower doses and is not recommended. High doses also have been associated with numerous short- and long-term adverse outcomes, including neurodevelopmental impairment.

7

Don't perform screening panels for food allergies without previous consideration of medical history.

Ordering screening panels (IgE tests) that test for a variety of food allergens without previous consideration of the medical history is not recommended. Sensitization (a positive test) without clinical allergy is common. For example, about 8% of the population tests positive to peanuts but only approximately 1% are truly allergic and exhibit symptoms upon ingestion. When symptoms suggest a food allergy, tests should be selected based upon a careful medical history.

8

Avoid using acid blockers and motility agents such as metoclopramide (generic) for physiologic gastroesophageal reflux (GER) that is effortless, painless and not affecting growth. Do not use medication in the so-called "happy-spitter."

There is scant evidence that gastroesophageal reflux (GER) is a causative agent in many conditions though reflux may be a common association. There is accumulating evidence that acid-blocking and motility agents such as metoclopramide (generic) are not effective in physiologic GER. Long-term sequelae of infant GER is rare, and there is little evidence that acid blockade reduces these sequelae. The routine performance of upper gastrointestinal (GI) tract radiographic imaging to diagnose GER or gastroesophageal disease (GERD) is not justified. Parents should be counseled that GER is normal in infants and not associated with anything but stained clothes. GER that is associated with poor growth or significant respiratory symptoms should be further evaluated.

9

Avoid the use of surveillance cultures for the screening and treatment of asymptomatic bacteruria.

There is minimal evidence that surveillance urine cultures or treatment of asymptomatic bacteruria is beneficial. Surveillance cultures are costly and produce both false positive and false negative results. Treatment of asymptomatic bacteruria also increases exposure to antibiotics, which is a risk factor for subsequent infections with a resistant organism. This also results in the overall use of antibiotics in the community and may lead to unnecessary imaging.

10

Infant home apnea monitors should not be routinely used to prevent sudden infant death syndrome (SIDS).

There is no evidence that the use of infant home apnea monitors decreases the incidence of SIDS; however, they might be of value for selected infants at risk for apnea or cardiovascular events after discharge but should not be used routinely.

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Society of Hospital Medicine – **Pediatric Hospital Medicine**

shm Society of Hospital Medicine

Five Things Physicians and Patients Should Question

1 Don't order chest radiographs in children with uncomplicated asthma or bronchiolitis.

National guidelines articulate a reliance on physical examination and patient history for diagnosis of asthma and bronchiolitis in the pediatric population. Multiple studies have established limited clinical utility of chest radiographs for patients with asthma or bronchiolitis. Omission of the use of chest radiography will reduce costs, but not compromise diagnostic accuracy and care.

2 Don't routinely use bronchodilators in children with bronchiolitis.

Published guidelines do not advocate the routine use of bronchodilators in patients with bronchiolitis. Comprehensive reviews of the literature have demonstrated that the use of bronchodilators in children admitted to the hospital with bronchiolitis has no effect on any important outcomes. There is limited demonstration of clear impact of bronchodilator therapy upon the course of disease. Additionally, providers should consider the potential impact of adverse events upon the patient.

3 Don't use systemic corticosteroids in children under 2 years of age with an uncomplicated lower respiratory tract infection.

Published guidelines recommend that corticosteroid medications not be used routinely in the management of bronchiolitis. Furthermore, additional studies in patients with other viral lower respiratory tract infections have failed to demonstrate any benefits.

4 Don't treat gastroesophageal reflux in infants routinely with acid suppression therapy.

Antireflux therapy has been demonstrated to have no effect in reducing the symptoms of grastroesophageal reflux disease (GERD) in children. Concerns regarding the use of proton-pump inhibitor therapy in infants include an inability to definitively diagnose pediatric patients according to the established criteria of GERD, lack of documented efficacy of acid suppression therapy in infants and the potential adverse effects associated with acid suppression therapy.

5 Don't use continuous pulse oximetry routinely in children with acute respiratory illness unless they are on supplemental oxygen.

The utility of continuous pulse oximetry in pediatric patients with acute respiratory illness is not well established. Use of continuous pulse oximetry has been previously associated with increased admission rates and increased length of stay. The clinical benefit of pulse oximetry is not validated or well documented.

BMC Health Services Research

RESEARCH ARTICLE Open Access

Use of low-value pediatric services in the Military Health System

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Abstract

Background: Low-value care (LVC) is understudied in pediatric populations and in the Military Health System (MHS). This cross-sectional study applies previously developed measures of pediatric LVC diagnostic tests, procedures, and treatments to children receiving care within the direct and purchased care environments of the MHS.

Methods: We queried the MHS Data Repository (MDR) to identify children ($n = 1,111,534$) who received one or more of 20 previously described types of LVC in fiscal year 2015. We calculated the proportion of eligible children and all children who received the service at least once during fiscal year 2015. Among children eligible for each measure, we used logistic regressions to calculate the adjusted odds ratios (AOR) for receiving LVC at least once during fiscal year 2015 in direct versus purchased care.

Results: All 20 measures of pediatric LVC were found in the MDR. Of the 1,111,534 eligible children identified, 15.41% received at least one LVC service, and the two most common procedures were cough and cold medications in children under 6 years and acid blockers for infants with uncomplicated gastroesophageal reflux. Eighteen of the 20 measures of pediatric LVC were eligible for comparison across care environments: 6 were significantly more likely to be delivered in direct care and 10 were significantly more likely to be delivered in purchased care. The greatest differences between direct and purchased care were seen in respiratory syncytial virus testing in children with bronchiolitis (AOR = 21.01, 95% CI = 12.23–36.10) and blood tests in children with simple febrile seizure (AOR = 24.44, 95% CI = 5.49–108.82). A notably greater difference of inappropriate antibiotic prescribing was seen in purchased versus direct care.

Conclusions: Significant differences existed between provision of LVC services in direct and purchased care, unlike previous studies showing little difference between publicly and privately insured children. In fiscal year 2015, 1 in 7 children received one of 20 types of LVC. These proportions are higher than prior estimates from privately and publicly insured children, suggesting the particular need to focus on decreasing wasteful care in the MHS. Collectively, these studies demonstrate the high prevalence of LVC in children and the necessity of reducing potentially harmful care in this vulnerable population.

Keywords: Pediatrics, Low-value care, Child health, Military health system, Big data, TRICARE

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Background

Healthcare costs in the United States have steadily increased over the last 20 years [1], reaching an estimated $2.9 trillion in spending in 2014 [2]. While this accounts for nearly $10,000 per person per year in 2017 [3], this expenditure does not necessarily translate into better health outcomes. Between 10 and 14% of all-payer healthcare spending represents inefficiencies in care delivery and overtreatment [4]. At best, these interventions provide no benefit to the patient, and at worst, they potentiate harm. Such care is broadly defined as "low-value care (LVC) or overuse" [5, 6]. Efforts such as Choosing Wisely [7], launched in 2012, have attempted to raise awareness regarding LVC across 500 physician-identified procedures that provide little to no patient benefit. However, these efforts do not provide a means of measuring low value care in a system.

Based on these lists, researchers have developed tools for examining LVC in large-scale claims data. For example, Schwartz et al. (2014) found that 25 to 42% of elderly Medicare beneficiaries received at least 1 of 26 low-value services in 2009, resulting in $1.9 billion to $8.5 billion in expenditures [8]. Segal, et al. (2014) produced a list of 20 "indicator procedures" representative of broader overuse within a large healthcare system [9]. This list was later applied to the Military Health System (MHS) by Koehlmoos, et al. (2019), who demonstrated the existence of LVC for the first time in the MHS among the adult beneficiaries [10]. Similarly, Chua et al. (2016) developed a novel set of 20 claim-based measures for measuring overuse in the pediatric population [11]. The study found that at least 1 in 10 commercially insured US children received one or more low-value pediatric services during 2014, resulting in $27.0 million in unnecessary spending, of which $9.2 million was paid out-of-pocket (33.9%).

The MHS provides care through a bifurcated system in which beneficiaries may receive Direct Care (DC) from providers at military treatment facilities (MTFs) including hospitals, major medical centers, and clinics, in the US and overseas; or Purchased Care (PC) through regional, non-exclusive civilian providers who accept the TRICARE insurance benefit. Building on the previous work, this study aimed to determine the degree of overuse for 20 previously published measures within the pediatric population of the MHS, as well as compare DC and PC systems for use of LVC. Results are expected to inform discussion of current plans to restructure the MHS, particularly the proposed shift of care for non-active duty beneficiaries including children to the civilian purchased care sector [12].

Methods

Data source and study design

We conducted a cross-sectional analysis of the 2015 Military Health System Data Repository (MDR) claims database. The MDR captures both encounter and claims data of care delivered at Military Treatment Facilities (MTFs/direct care) and at civilian fee-for-service facilities (purchased care) covered by TRICARE. TRICARE is the MHS insurance product, which provides universal coverage to approximately 9.4 million members. TRIC ARE beneficiaries include 20% active-duty military personnel and 80% retirees or family members, and are likely representative of the U.S. population under age 65 [13–16]. TRICARE does not include care delivered in combat zones, or through Veterans Affairs (VA) hospitals which are part of a separately administered system. TRICARE data have previously been employed in several studies designed to evaluate the quality of healthcare delivery in a variety of clinical contexts including surgical care, women's health and pediatrics [17–19].

Study population

Utilizing the Defense Enrollment Eligibility Reporting System (DEERS), this study identified 1,111,534 children and adolescents aged 0 to 18 years old, who were dependents of active duty and retired service members, and dependent survivors; and enrolled in TRICARE Prime benefits for the full 2015 fiscal year. As the MHS follows the Federal fiscal year calendar, the selection of dates for analysis includes October 1, 2014-September 30, 2015, and does not include the ICD-10-CM transition in October 2015. Selecting children who were dependents of active duty and retired service members, and dependent survivors ensured the study population would consistently utilize the MHS, and also eliminated the possibility of the older population (those aged 17 and 18) having enlisted status as either active duty or reservists and National Guard service members.

Construction of low-value service measures

We adopted all 20 LVC measures in pediatric services developed by Chua et al. (2016) and which are reported here exactly as previously described [11]. No license was required in order to use this tool. Eleven of these measures were tests (6 diagnostic and 5 imaging), and the remainder were pharmaceuticals [11, 20]. Pharmaceutical codes for this study were adapted from the Market Scan therapeutic codes as used by Chua et al., and assessed in the MDR according to their American Hospital Formulary Service (AHFS) identification, as shown in Additional file 1. Because many measures reported by Chua, et al. (2016) excluded children with specific diagnosis or procedure codes in previous claims, we used the fiscal year 2014 MDR records as a "look-back period" for the identification of LVC measures in fiscal year 2015. Due to the unavailability of exact birth date in the datasets, this study was not able to exclude infants aged < 90 days or neonates aged <= 28 days, and reduced the exclusion

criteria to include all infants aged 0 years. This will only influence Measure 3, Testing for Respiratory Syncytial Virus (RSV) in Children with Bronchiolitis, and Measure 8, Ultrasound in Children with Cryptorchidism. We used the narrow, more specific versions of the measures developed by Chua et al. (2016) [11].

Statistical analyses

We calculated the proportion of children eligible for the measure who received the service at least once during fiscal year 2015, the number of services received per 100 eligible children, the proportion of children in the overall sample who received the service at least once during fiscal year 2015, and the proportion of children in the overall sample who received at least 1 of the 20 low value services during fiscal year 2015. In order to compare LVC measures in direct care vs. purchased care, patients were identified by the following criteria: 1) patients were assigned to direct or purchased care based on whether their primary care manager was in direct or purchased care, 2) those without a primary care manager were excluded, and 3) those who received any care in both direct and purchased care during fiscal year 2015 were excluded. Among children eligible for each measure, logistic regressions, adjusted by age and gender, were performed to compare the likelihood LVC in direct vs. purchased care. Due to the measure constructs and pharmacy data elements, we were unable to make comparisons in two measures (12: Cough and cold medications in children under 6 years, and 20: Acid blockers for infants with uncomplicated gastroesophageal reflux). All analyses were performed using SAS version 9.4 (SAS Institute, Inc., Cary, NC). The work was found exempt by the Institutional Review Board of the Uniformed Services University of the Health Sciences.

Results

Overuse procedures

Our study identified 1,111,534 eligible children (Table 1). Slightly more than 50% were male and 49% were female. The children were almost evenly split between the three age categories (0–5 year, 6–12 years, and 13–18 years) at 32.7, 37, and 30.3% respectively. In terms of primary care network, 68% of children were registered to the Direct Care setting and 31.5% were registered to receive care at civilian clinics and facilities in the Purchased Care setting.

All 20 measures of low value care were found in the MDR (Table 2). As seen in Table 2, the number of children receiving each test, procedure, or treatment varied from 39 for neuroimaging in simple febrile seizures, to 108,574 for cough and cold medications in children under 6 years. Per 100 children in denominator, the lowest rate of use was sinus imaging for children with acute sinusitis (0.19) and the greatest rate of use was oral antibiotics for acute otitis media with effusion (41.32). Overall, 15.41% of children in our study population received at least one indicator of low-value care by the narrow measure constructs, and a total of 1,106,366 children from our study population were the eligible for the comparison analysis of direct (n = 755,741) vs. purchased care (n = 350,625).

Table 1 Study Population Demographics, n = 1,111,534

	Count (%)
Gender	
Male	567,086 (51.0)
Female	544,448 (49.0)
Age Group	
0–5	363,376 (32.7)
6–12	411,263 (37.0)
13–18	336,895 (30.3)
Primary Care Manager's Network	
Direct Care	755,741 (68.0)
Purchased Care	350,625 (31.5)
None	5168 (0.5)

This study also compared results from DC vs PC (Table 3). Six services were significantly more likely in direct care, with the greatest differences observed in blood tests in children with simple febrile seizure (AOR = 24.44, 95% CI = 5.49–108.82) and testing for respiratory syncytial virus (RSV) in children with bronchiolitis (AOR = 21.01, 95% CI = 12.23–36.10). The service with the lowest odds of occurrence in direct care was cervical cancer screening with HPV test, or Papanicolau test (Pap smear) in children (AOR = 0.07, 95% CI = 0.05–0.09). Two services showed no statistical difference: ultrasound in children with cryptorchidism (AOR = 0.68, 95% CI = 0.44–1.06) and neuroimaging in children with simple febrile seizure (AOR = 1.42, 95% CI = 0.37–5.42). All measures of inappropriate antibiotic prescribing practices (measures 13 to 17) were least likely to occur in direct care, with the lowest odds observed in oral antibiotics for tonsillectomy (AOR = 0.14, 95% CI = 0.08–0.25).

Discussion

In this study, 1 in 7 MHS children received at least one of 20 low-value services during fiscal year 2015. Rates of low-value service use differed according to whether care was delivered in direct versus purchased care, with 6 services significantly more likely to be delivered in direct care and 10 services significantly more likely to be delivered in purchased care. A greater difference in antibiotic prescription practices was also observed, with all 5

Table 2 Use of 20 Low Value Service Measures and Risk Ratios

No.	Service[a]	Denominator Definition[a]	No. of Children in Denominator	No. Receiving Service at Least Once During FY	% of Denom Receiving Service at Least Once During FY	% of All Children ($n = 1,111,543$) Receiving Service at Least Once During FY	No. of Services During FY	No. of Services per 100 Children in Denominator
1	Population-based screening for vitamin D deficiency	All children	1,111,534	10,242	0.92	0.92	10,753	0.97
2	Skin prick test or IgE blood tests in children with atopic dermatitis	Children with a diagnosis of atopic dermatitis during the FY	27,659	340	1.23	0.03	356	1.29
3	Testing for RSV in children with bronchiolitis	Children with diagnosis of bronchiolitis during FY	13,813	1096	7.93	0.10	1143	8.27
4	Blood tests in children with a simple febrile seizure	Children with diagnosis of simple febrile seizure during FY	1987	129	6.49	0.01	137	6.89
5	Cervical cancer screening w/ HPV test or papanicolaou test in children	Female children aged ≥14 years	139,425	1115	0.80	0.10	1137	0.82
6	Testing for group A streptococcal pharyngitis in children aged < 3 years	Children aged < 3 years	177,669	19,467	10.96	1.75	24,979	14.06
7	Face or nose radiograph in children with head or face trauma	Children with diagnosis of head or face trauma during FY	57,943	1013	1.75	0.09	1023	1.77
8	Ultrasound in children with cryptorchidism	Children with diagnosis of cryptorchidism during FY	1823	348	19.09	0.03	354	19.42
9	Sinus imaging in children with acute sinusitis	Children with diagnosis of acute sinusitis during FY	44,399	68	0.15	0.01	85	0.19
10	Neuroimaging in children with a simple febrile seizure	Children with a diagnosis of simple febrile seizure during the FY	1987	39	1.96	0.00	39	1.96
11	Neuroimaging in children with headache	Children aged ≥12 years with a diagnosis of headache during the FY	29,801	2807	9.42	0.25	3022	10.14
12	Cough and cold medications in children aged < 6 y	Children aged < 6 years	363,376	108,574	29.88	9.77	136,381	37.53
13	Oral antibiotics for acute upper respiratory infections	Children with a diagnosis of acute upper respiratory infection during the FY	224,222	28,156	12.56	2.53	29,440	13.13
14	Oral antibiotics for acute OME	Children with a diagnosis of acute OME during the FY	26,313	10,553	40.11	0.95	10,872	41.32
15	Oral antibiotics for acute otitis externa	Children with a diagnosis of acute otitis externa during the FY	22,399	2184	9.75	0.20	2249	10.04
16	Oral antibiotics after tonsillectomy	Children undergoing tonsillectomy during the FY	6727	612	9.10	0.06	612	9.10
17	Oral antibiotics for bronchiolitis	Children with a diagnosis of bronchiolitis	13,813	2245	16.25	0.20	2368	17.14

Table 2 Use of 20 Low Value Service Measures and Risk Ratios *(Continued)*

No.	Service[a]	Denominator Definition[a]	No. of Children in Denominator	No. Receiving Service at Least Once During FY	% of Denom Receiving Service at Least Once During FY	% of All Children ($n = 1,111,543$) Receiving Service at Least Once During FY	No. of Services During FY	No. of Services per 100 Children in Denominator
		during the FY						
18	Oral corticosteroids for bronchiolitis	Children with a diagnosis of bronchiolitis during the FY	13,813	2857	20.68	0.26	3222	23.33
19	Short-acting β-agonists for bronchiolitis	Children with a diagnosis of bronchiolitis during the FY	13,813	5209	37.71	0.47	5634	40.79
20	Acid blockers for infants with uncomplicated gastroesophageal reflux	Infants aged < 1 year	54,023	2395	4.43	0.22	5168	9.57

[a]Measures and denominator definitions as described by Chua, et al [11]

services more likely to be received in purchased versus direct care.

The MHS, due to its bifurcated structure, enables a comparison of the provision of care under different payment models, and is especially relevant to discussions of the MHS transition to a high-reliability organization focused on value-based care. Simultaneously, the MHS is planning to reduce the numbers of its uniformed providers, including those providing pediatric care, by 17,000 positions in order to fulfill priorities focused on military readiness [12]. Such changes would shift the vast majority of pediatric services for TRICARE beneficiaries to purchased care. In this context, the discussion of low-value pediatric care is both timely and relevant, as it provides an opportunity to reduce costly care that provides no benefit, reduce harm to patients, and repurpose existing resources for more efficient and appropriate use of care. Therefore, this study informs discussion by identifying opportunities to improve pediatric care across the MHS, and evaluating differences in low-value pediatric care between the DC and PC environments.

We found that six low-value procedures are significantly more likely to be provided in direct care: skin prick or IgE blood test for atopic dermatitis, testing for RSV in children with bronchiolitis, blood tests for simple febrile seizure, face or nose radiograph for children with head or face trauma, sinus imaging in children with acute sinusitis, and short-acting beta-antagonists for bronchiolitis. The prevalence of face or nose radiographs after trauma may reflect current military focus on preventing traumatic brain injury, which originates from practice management implications in the adult population. One set of procedures, performing HPV test or Pap smear on children, was much less likely to be performed in direct vs. purchased care. The lower rate in direct care may be the result of outsourcing of care to civilian facilities rather than an overt focus on providing fewer of these procedures across the MHS.

Further insight is gained from comparing rates in the MHS to those seen in private insurance systems. Chua, et al. [11] reported that 9.6% of children received at least one low-value procedure during 2014. In contrast, 15.4% of children in the MHS received at least one low-value procedure during 2015. A follow-up study by Chua, et al. [21] found 1 in 9 publicly insured and 1 in 11 privately insured children receiving LVC in 2014, concurring with earlier findings and demonstrating relatively little difference between their two payment systems.

Significant differences in the rates of two services involving the prescription of oral antibiotics were observed in the MHS compared to publicly and privately insured children. In this study, 9.8% of the eligible population of military children received oral antibiotics for acute otitis externa, and 9.1% received oral antibiotics after tonsillectomy. These rates are significantly lower than those found by Chua, et al. (2020) in publicly and privately insured children, with 25.3% of publicly insured and 24.3% of privately insured children receiving oral antibiotics for acute otitis externa, and 29.0% of publicly insured and 27.5% of privately insured children receiving oral antibiotics after tonsillectomy.

Another notable difference was found in the prescription of cough and cold medicines. In this study, 30% of the eligible population of military children received one or more cough or cold medicines during the study period, in contrast to the previously-reported 8.5% of publicly insured and 3.2% of privately insured children [11, 20]. A review of coding indicates that this is a true difference and not due to different definitions of these medications between studies. Although the reason for this difference cannot be determined from the data set,

Table 3 Comparison of Low-Value Care in Direct versus Purchased Care

No.	Service[a]	No. Receiving Service in DC	No. Receiving Service in PC	No. in DC Denominator	No. in PC Denominator	% of DC in the Denominator Receiving Service	% of PC in the Denominator Receiving Service	Adjusted[b] OR (95% CI) for Direct Care
1	Population-based screening for vitamin D deficiency	1605	3189	386,450	306,462	0.42	1.04	0.48 (0.45–0.51)*
2	Skin prick test or IgE blood tests in children with atopic dermatitis	88	29	136	6975	64.71	0.42	3.23 (2.10–4.97)*
3	Testing for RSV in children with bronchiolitis	331	25	1876	2998	17.64	0.83	21.60 (14.29–32.65)*
4	Blood tests in children with a simple febrile seizure	22	2	180	326	12.22	0.61	24.44 (5.49–108.82)*
5	Cervical cancer screening w/ HPV test or Papanicolaou test in children	39	721	39,269	48,531	0.10	1.49	0.07 (0.05–0.09)*
6	Testing for group A streptococcal pharyngitis in children aged < 3 years	3772	4241	65,830	29,065	5.73	14.59	0.36 (0.34–0.38)*
7	Face or nose radiograph in children with head or face trauma	207	219	8892	13,910	2.33	1.57	1.98 (1.62–2.42)*
8	Ultrasound in children with cryptorchidism	45	63	282	310	15.96	20.32	0.68 (0.44–1.06)
9	Sinus imaging in children with acute sinusitis	12	40	3480	20,976	0.34	0.19	1.99 (1.03–3.81)*
10	Neuroimaging in children with a simple febrile seizure	4	5	180	326	2.22	1.53	1.42 (0.37–5.42)
11	Neuroimaging in children with headache	175	997	3084	10,632	5.67	9.38	0.59 (0.50–0.69)*
12	Cough and cold medications in children aged < 6 y	–	–	–	–	–	–	–
13	Oral antibiotics for acute upper respiratory infections	3235	9830	50,148	54,391	6.45	18.07	0.35 (0.34–0.37)*
14	Oral antibiotics for acute OME	1219	3475	3300	8419	36.94	41.28	0.82 (0.75–0.89)*
15	Oral antibiotics for acute otitis externa	333	589	4069	6092	8.18	9.67	0.82 (0.72–0.95)*
16	Oral antibiotics after tonsillectomy	13	211	677	1815	1.92	11.63	0.14 (0.08–0.25)*
17	Oral antibiotics for bronchiolitis	186	648	1876	2998	9.91	21.61	0.48 (0.40–0.58)*

Table 3 Comparison of Low-Value Care in Direct versus Purchased Care *(Continued)*

No.	Service[a]	No. Receiving Service in DC	No. Receiving Service in PC	No. in DC Denominator	No. in PC Denominator	% of DC in the Denominator Receiving Service	% of PC in the Denominator Receiving Service	Adjusted[b] OR (95% CI) for Direct Care
18	Oral corticosteroids for bronchiolitis	276	684	1876	2998	14.71	22.82	0.62 (0.53–0.72)*
19	Short-acting β-agonists for bronchiolitis	795	1158	1876	2998	42.38	38.63	1.16 (1.03–1.31)*
20	Acid blockers for infants with uncomplicated gastroesophageal reflux	–	–	–	–	–	–	–

[a]Measures and denominator definitions as described by Chua, et al [11]
[b]Logistic regression models for each measure were adjusted by age and gender
*Statistically significant Adjusted Odds Ratio (AOR) and 95% Confidence Interval (CI), p-value < 0.05
– Data unavailable due to inability to compare direct vs purchased care under defined measure constructs

it may be due to the availability of these medications in the MHS formulary, in which they can be obtained at no cost to the patient when obtained at a Military Treatment Facility or at a very low co-payment at a networked pharmacy, vs. other systems in which the patient bears some cost in obtaining them from a pharmacy or as an over-the-counter product.

A notable finding is the difference in antibiotic prescription patterns between purchased and direct care. In all five cases, children in the direct care system were less likely to receive low-value antibiotic prescriptions (oral antibiotics for acute upper respiratory infection, for otitis media with effusion, for otitis externa, for bronchiolitis, and after tonsillectomy) than in the purchased care system. This is a particular concern in light of current discussions of antibiotic-resistant disease driven in part by inappropriate prescribing practices, although data did not illustrate the reason for the difference between the two care systems.

Strengths and limitations

There are several notable strengths in this investigation. The population is comprised of a large number of children and adolescents ($n = 1{,}111{,}534$) who receive care through universal insurance, and as such, may provide a model for practice patterns in the setting of insurance expansion in the greater US population. Additionally, the provision of care through different practice environment presents opportunities to examine the effect of fixed-fee (direct care) or fee-for-service (purchased care) payment models on the delivery of low-value care. Notably for this study, it appears that low-value pediatric care is provided with variation between the fixed-fee vs. fee-for-service system, with greater use of low-value antibiotic treatment taking place in the purchased care sector. This is in similar to previous studies in the MHS adult population which showed utilization of less-invasive procedures, and greater adherence to treatment guidelines, in direct care [10, 16, 21, 22]. Our current findings suggest that current plans to shift pediatric health services in the MHS to purchased care may result in an increase in the use of some low value services while increasing the inappropriate use of antibiotics.

We also recognize several limitations in this work. First, the use of administrative data renders it susceptible to any errors in coding at the provider level, and does not capture the nuances of care in which use of low value procedures may be clinically appropriate. Second, given the use of de-identified data, this study does not have full date of birth for its patients, so that tests provided to children in the first year of life may not be accurately captured.

Conclusions

Using 20 previously developed measures, this study found evidence of low-value care in pediatric health services in the MHS. Significant differences existed between the provision of low value services in direct and purchased care settings, as well as between the MHS and previous research relying on patients with private insurance. Further research is needed to understand the etiologies behind these differences. In the current period of MHS reform, as pediatric health services are increasingly shifted to the purchased care, the results of our work indicate that such policies may result in increases in low value care and associated expenditures including an increased risk of inappropriate antibiotic use.

Supplementary information

Supplementary information accompanies this paper at https://doi.org/10.1186/s12913-020-05640-5.

Additional file 1. Drugs Used in Measure Definitions. Names and codes of drugs used for investigation of Measures 13–20. Separately uploaded in accordance with Journal guidelines.

Abbreviations

AHFS: American Hospital Formulary Service; AOR: Adjusted Odds Ratio; CI: Confidence Interval; DC: Direct Care; DEERS: Defense Enrollment Eligibility Reporting System; Denom: Denominator; DoD: Department of Defense; HPV: Human Papillomavirus; LVC: Low Value Care; MDR: Military Health System Data Repository; MHS: Military Health System; NA: Not Applicable; Num: Numerator; PC: Purchased Care; RSV: Respiratory Syncytial Virus; US: United States; VA: Veterans Affairs

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Authors' contributions

TK, AS, and JW designed the study. TK and AB acquired the data. AB performed the coding and analysis. AB and TK analyzed the data. QL, CM, AB, TK, and AS wrote the first draft. CM, AS, JW, and TK provided scientific oversight and critical revision. All authors contributed to data interpretation and approved the final version for publication.

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Availability of data and materials

The data that support the findings of this study are available from the United States Defense Health Agency. Restrictions apply to the availability of these data, which were used under federal Data User Agreements for the current study, and so are not publicly available.

Ethics approval and consent to participate

Due the secondary analysis of existing, de-identified data, this study was deemed exempt from human subjects review by the Institutional Review Board of the Uniformed Services University of the Health Sciences. Because of these conditions, written consent to participate, including by parents or guardians for children under 18, is not applicable. Permission and conditions for use of these data were granted by the United States Defense Health Agency.

Consent for publication

Due to the secondary analysis of de-identified data, consent for publication is not applicable.

Competing interests

The authors declare that we have no competing interests.

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Publisher's Note

"Choosing Wisely" Quiz

1a. The AAP used a 3 stage process to select its list of ChoosingWisely® treatments. In the second stage, the expert review and evaluation narrowed 100 topics down to 10. What criteria did the AAP use to make its final list?

- Evidence to document unproven clinical benefit
- Potential to cause harm
- Over-prescribed & over-utilized
- Within the purview of pediatrics

1b. Based on these criteria, are there any other medications, tests, procedures you would include?

frenotomies? DocBands? Viral PCRs?

2. What are the 4 basic communication skills the AAP deems necessary to promote patient/ parent understanding of the ChoosingWisely® recommendations?

- Provide clear recommendations *(use guidelines, avoid jargon, provide written materials)*
- Elicit patient beliefs/questions *(nonjudgmental, "curious questions", silence)*
- Provide empathy, partnership, legitimation *("I understand your worries & I'm ready to address them"—studies show this does not significantly prolong encounters)*
- Confirm agreement/overcome barriers *(check understanding, plan follow-up)*

3. List the 5 main **AAP** recommendations and the 5 **SHM-PHM** recommendations. Provide a brief rationale for each. And, indicate your current level of adherence:

Recommendation to Avoid	Rationale	Adherence (%)
Antibiotics for URIs	Increases toxicity & resistant organisms	
Cough & cold remedies	No benefit; risk of OD if multiple ingredient	
Head CT s/p head trauma	1/1500 kids<15 who undergo 1 head CT will develop a lethal malignancy; use PECARN	
MRI s/p febrile seizure	Risk of sedation; high cost	
CT for abdominal pain	Radiation overdose; risk of cancer	
CXR for bronchiolitis	Limited clinical utility; will reduce costs	
Albuterol for bronchiolitis	No effect on outcomes; increase adv events	
Steroids for LRTI in <2yo	No demonstrated benefit in bronchiolitis	
PPIs for routine GERD	No effect on sxs; potential adv events	
Continuous Pox for RTIs	Increases admission rates and LOS	

"Choosing Wisely" Discussion Questions

Based on National Survey of Physicians on Unnecessary Tests and Procedures in the Healthcare System (Feb-Mar14)—see *Extra Credit link* for survey results and compare your own responses.

1. Do you think the frequency of unnecessary tests and procedures in the health care system is a problem?

2. In your own practice, how often do parents ask for a test or procedure that you think is unnecessary?

3. How often do patients/parents follow your advice and avoid the unnecessary test or procedure?

4. Let's say a parent came to you convinced that her child needed a specific test. You knew the test was unnecessary, but the parent was quite insistent. Would you refuse to order the test? Would you order the test but still advise against it?

5. In your own practice, why do you sometimes end up ordering an unnecessary test or procedure? (e.g. just to be safe, to reassure yourself, parents insisting on test, wanting to keep patients/parents happy, not enough time with patients, new technology in practice)

6. Do you feel comfortable or uncomfortable talking to parents about why they should avoid an unnecessary test or procedure for their child?

7. When parents ask for a test or procedure you feel is unnecessary, how often do you talk to them about WHY they should not have the test or procedure?

8. How often do you talk with your patients about the COST of tests and procedures?

9. How much responsibility do you feel you have for making sure your patients avoid unnecessary tests and procedures?

10. Who do you think is in the best position to help address the problem of unnecessary tests and procedures? (e.g. physicians, the government, trial lawyers, patients, insurance companies, hospitals)

11. After reviewing the ChoosingWisely campaign, do you think you will reduce the number of unnecessary tests you order? Do you think you will talk to parents more about avoiding unnecessary care?