Original Article

Unnecessary ultrasounds in children with undescended testes: An interrogation of the impact of the Choosing Wisely campaigns and clinical practice guidelines

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Abstract

Objectives: Over the past decade, clinical practice guidelines and educational campaigns have counselled against the use of routine ultrasound (US) in the diagnosis of undescended testes (UDT). We aimed to establish whether or not there has been change in the proportion of children with UDT undergoing pre-referral US prior to referral to our centre over this period. We also sought to determine whether type of referring specialist, UDT diagnosis, and patient distance from the hospital had impacted the rate of pre-referral US.

Methods: A select sample of hospital charts of children undergoing orchidopexy at a single tertiary paediatric urological referral centre between 2010 and 2019 were reviewed. Data regarding age at surgery, cryptorchidism diagnosis, type of referring physician, patient distance from institution, and evidence of US as part of diagnostic work-up were extracted.

Results: Five hundred charts were examined. Referring provider specialty impacted the number of US ordered ($P=0.01$). On subset analysis, paediatricians ordered fewer US for children with palpable UDT in 2014 ($P=0.03$). In 2018, community urologists ordered no US ($P=0.02$). These findings had temporal relationships with guideline release. The proportion of children undergoing US each year remained consistently between 50% and 62%, except in 2014, when only 36% had US. Distance from hospital and UDT diagnosis were of no significance.

Conclusion: Despite clinical practice guidelines and Choosing Wisely campaign recommendations, significant numbers of children with UDT still undergo US. Transient changes in sub-specialty guideline adherence are observed. Strategies to improve sustained guideline awareness in referring clinicians need to be considered.

Keywords: *diagnostic ultrasound; Choosing Wisely; low-value care; undescended testes*

Undescended testes (UDT) is a common condition of early childhood and is the most common genitourinary anomaly in males, with an estimated occurrence of 1% to 3% in full-term boys and up to 45% of preterm male neonates (1). Spontaneous descent frequently occurs in the first 3 to 6 months of life, and the prevalence of UDT stabilizes at around 0.7% to 1% by the age of 1 year (2).

It is best practice to avoid overuse of diagnostic tests, even where they are perceived to do no harm, and using ultrasound (US) to assist in the diagnosis of UDT is such a test. Physical examination by an experienced healthcare provider is the most important component of the assessment of children with potential UDT. Although common, the use of imaging such as US to assist in the diagnosis of UDT offers no diagnostic

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benefit; in the hands of an experienced clinician, 70% to 77% of UDT are palpable on clinical exam (3,4). In the case of palpable UDT, US does not reliably localize testes and so does not change the surgical approach, which may be through an inguinal or scrotal incision (3,5). Where testes are impalpable, US cannot reliably confirm that the testes are in fact absent, and so diagnostic laparoscopy is still mandatory (3,6). Furthermore, ordering US may in fact cause harm as it incurs unnecessary costs and results in delay to specialist referral (4,7) in a condition that relies on timely surgery in order to optimize fertility (2,3). Numerous clinical practice guidelines (CPGs) published in the past decade counsel against the use of diagnostic US in this condition. These include CPGs published by the European Society for Pediatric Urology (ESPU) (8), the Agency for Healthcare and Research Quality (AHRQ) (9), the American Urological Association (AUA) (10), the British Association of Paediatric Surgery (BAPS) (11), and the Canadian Urologic Association-Pediatric Urologists of Canada (CUA-PUC) (2). Furthermore, Choosing Wisely (CW), in association with the AUA (12), and CW Canada, in association with the CUA (13), have issued recommendations against ordering US in boys with cryptorchidism as part of their campaign to reduce medical overuse of low-value care.

The aim of this study was to assess the impact of the above CPGs and recommendations on the rate of diagnostic imaging for UDT in children undergoing orchidopexy at our institution over the past decade. Our secondary aims were to determine whether or not type of referring clinician and geographic location of the patient had any bearing on US acquisition.

METHODS

Following approval from our institutional Quality Improvement Committee, we retrospectively reviewed the charts of patients who underwent orchidopexy by our division, which provides paediatric urological services at a quaternary, academic paediatric hospital in Ontario over a 10-year period (2010 to 2019, inclusive). Eligible patients were identified using the intervention codes 1.QM.74.LA or 1.QM.74.DA, which refer to patients who have undergone fixation of the testis/testes using an open (incisional) or endoscopic approach, respectively. We excluded patients with a repeat orchidopexy and all second-stage orchidopexy procedures (i.e., patients undergoing the second half of a staged procedure for intra-abdominal testes). The list of electronic medical records was obtained from our institution's health information management database. We selected the first five patients with complete medical records who had no exclusion criteria to undergo orchidopexy each month from February through November of each year of the specified time period. We excluded January and December as in these months there is a break period and so the volume of elective surgeries is significantly decreased.

Variables collected included evidence of US as part of diagnostic work-up, age at surgery, cryptorchidism diagnosis,

comorbidities (if present), type of referring provider (paediatrician, family physician, community urologist, or other), and patient postal codes to track patient distance from our institution. Evidence of US was obtained by evaluating the chart for imported images, reports of images obtained at another institution, narrative description of previous US in referral letters, and the presence of scrotal US obtained at this institution at a time that pre-dated the index clinic visit with our division. Information regarding the specialty of referring providers was extracted through the online database of registered Ontario doctors of The College of Physicians and Surgeons of Ontario (14). Distances between patient area of residence and our institution were quantified by entering postal codes into Google Maps (15) and the shortest driving distance to our institution was used.

Descriptive statistics were computed to summarize collected data. Chi-squared tests or Mann-Whitney *U*-tests (adjusted with Bonferroni corrections for post hoc analysis) were used where appropriate to determine potential differences in total or yearly US ordered with respect to age, educational background of the referring provider, cryptorchidism diagnosis, and patient distance from our institution. All statistical analyses were conducted using SPSS (version 14.0, IBM Corp.) and a criterion of $P < 0.05$ was used to denote significance.

RESULTS

The charts of 500 patients who underwent orchidopexy during the study period were reviewed. This represented a sample representing 15% of the total number of children undergoing orchidopexy during this period. The median age at surgery was 26 months (interquartile range 14 to 75 months), and this age was not significantly different between patients who did and did not undergo pre-referral US. At assessment by a paediatric urologist, 373 (75%) patients were found to have palpable UDT. The majority of patients were referred by a paediatrician ($n=263$, 53%) or a family physician ($n=147$, 29%). The remainder were referred by a community urologist ($n=48$, 10%) or another practitioner, including nurse practitioners (NPs), paediatric surgeons, and clinicians whose specialty we could not determine ($n=42$, 8%). Looking at NPs and paediatric surgeons specifically, three of seven referring NPs and five out of five paediatric surgeons requested US. Around three quarters ($n=360$, 72%) of patients lived within 50 km of our institution.

In total, 265 (53%) patients underwent inguinal and/or scrotal US for the purpose of locating UDT prior to referral. The number of pre-referral US ordered differed significantly when considering referring provider specialty ($P=0.01$). In our analysis, community urologists were found to order a lower proportion (15 of 48; 31%) of pre-referral US compared to paediatricians (140 of 263; 53%), family physicians (85 of 147; 58%), or other referring providers such as paediatric surgeons, NPs, and those whose specialty

could not be identified (25 of 42; 60%). After cross-referencing with our own PACS system, we found that 82 US pre-referral US were performed on-site at our institution: 53 of these were requisitioned by external clinicians, 24 by on-site paediatricians, and 5 by on-site general surgeons. Paediatric urologists from our own division requested US in seven patients after initial consult. We found no differences in rates of pre-referral US when interrogating patient distance from our institution, age at surgery, UDT diagnosis (palpable versus impalpable), or presence of comorbidities (Table 1).

When assessing trends over time (Figure 1), we found that the proportion of children undergoing pre-referral diagnostic

US each year remained consistently between 25 of 50 (50%) and 31 of 50 (62%) except in 2014, when only 18 of 50 (36%) referred children had pre-referral imaging. When controlling for referring provider specialty (Figure 2; Supplementary Table 1), we found that in 2014, paediatricians ordered fewer US for children with palpable compared to impalpable UDT (5 of 18, 28% versus 6 of 8, 78%, $P=0.03$). In 2018, the year after the CUA-PUC guideline was released, community urologists were the only referring providers to order no US (0 of 3 versus 10 of 12, 83%; 13 of 30, 43%; or 4 of 5, 80% ordered by family physicians, paediatricians, or other referring providers, respectively, $P=0.02$). We note, however, that this is a very small subgroup which limits the generalizability of the analysis.

Table 1. Influence of variables on ultrasound (US) acquisition

Variable	US ordered		P
	Yes, N (%)	No, N (%)	
Total	265 (53)	235 (47)	
Age at surgery (months)	27.8 (14.4–80.2)	26 (14.4–67)	0.5
Referring provider			0.01
Paediatrician	140 (53)	123 (52)	
Family physician	85 (32)	62 (26)	
Urologist	15 (6)	33 (14)	
Other	25 (9)	17 (7)	
Cryptorchidism diagnosis			0.42
Palpable	195 (74)	178 (76)	
Impalpable	64 (24)	49 (21)	
Other (retractile or descended)	6 (2)	8 (3)	
Distance from hospital			0.03*
<10 km	36 (14)	50 (21)	
10 km to <25 km	60 (23)	47 (20)	
25 km to <50 km	99 (37)	68 (29)	
50 km to <100 km	31 (12)	41 (17)	
100+ km	39 (15)	29 (13)	
Other diagnosis			0.35
Hypospadias	4 (2)	6 (3)	
Disorder of sexual differentiation	0	2 (1)	
Congenital syndrome	11 (4)	12 (5)	
None	250 (94)	215 (91)	

*Not significant at the Bonferroni adjusted P-value of 0.02.

DISCUSSION

CPGs are intended to make recommendations that optimize patient care. They are informed by systematic review of evidence that allows them to provide an assessment of the benefits and harms of possible care options for a specific medical condition (16), and have been shown to improve outcomes and cost-effective practices in multiple settings (17). CPGs issued over the past decade from urological associations in the USA (9,10), Canada (2), Britain (11), and Europe (8) provide recommendations on the diagnosis and management of UDT. These CPGs are of high quality and have consistent recommendations, and all of them advise against the use of US or other diagnostic imaging in the investigation of UDT (17). CW is a campaign that aims to help clinicians and patients avoid the overuse of low-value care (18). Regarding UDT, both CW (12) and CWC (13) reinforce the advice that US is an unnecessary diagnostic test in boys with cryptorchidism. In addition to US being unnecessary, it has potential negative impacts in that it incurs costs and potentially causes delay to surgery. Although we found that there was no statistically significant difference in age at surgery for boys who did and did not undergo pre-referral US, we do note that the median age at surgery for the entire group was 26 months, which is well outside of the CUA-PUC recommended window (2). The reasons for this delay are multi-factorial and are due to hold-ups at various stages on the path from diagnosis to surgery, and elimination of waiting periods at any stage of this pathway are likely to be helpful.

Previous studies found that in boys with cryptorchidism in Ontario, there was increasing use of US over time in the first decade of the 21st century (7), with fairly stable usage from 2008 to 2017 (19). Our study finds that over the past decade, the rate of pre-referral US in patients undergoing orchidopexy at our institution remained consistently between 50% and 62%, with an exception in 2014 when the rate of pre-referral US dropped especially amongst patients referred with palpable UDT by paediatricians. The CW recommendation to avoid ordering US in boys with cryptorchidism was issued in 2013, and it is

Figure 1. Rate of overall pre-referral ultrasounds in patients diagnosed with undescended testes and timing of clinical practice guideline and campaign publication.

Figure 2. Rate of pre-referral ultrasounds by specialty in patients diagnosed with undescended testes and timing of clinical practice guideline and campaign publication.

possible that at the time of its release there was increased publicity and awareness around this specific recommendation that resulted in a brief adjustment in practice. The effect does not seem to have been sustained, despite subsequent CPGs and recommendations released by Canadian authorities such as the CUA and CWC.

Paediatricians and family doctors order US in over half of the patients they refer to our unit. Primary care physician awareness of CPGs surrounding the diagnosis and management of UDT has previously been interrogated. In Europe, the ESPU Guideline on Paediatric Urology in 2007 already advised against the use of US in the work-up of UDT (20) and has been updated annually since, and BAPS issued a CPG recommending the same in 2015 (11). Despite these, in the UK, 80% of general practitioners surveyed between 2011 and 2012 believed that US was routinely used in the diagnosis of UDT (21), and a survey of almost 1,000 physicians in Germany between 2015 and 2017 found that one third of respondents were not aware of any current guidelines, and that only 44% of general practitioners answered questions about UDT in accordance with current guideline recommendations (22). These CPGs were published by specialist urologic and paediatric surgery organizations, and it is likely that physicians do not engage broadly with guidelines not issued by their own specialty. Campaigns such as CW and CWC may get more attention from a wider spectrum of practitioners. Awareness of CW amongst surveyed primary care physicians in the USA sits between 50% and 66%, with the vast majority of physicians who are aware of the campaigns stating that the recommendations are legitimate and useful (23–25). In Canada, it has been previously found that there was no significant change in physician behaviour relating to three urological CWC recommendations (19), but that CWC campaign implementation positively impacted rates of unnecessary testing amongst primary care physicians in other areas (26,27).

Nevertheless, the overuse of US in the diagnosis of UDT seems to remain unchanged. Changing physician behaviour is notoriously challenging. Regarding overuse of low-value care specifically, perceived barriers to reduction include malpractice concerns, time and economical constraints, easy access to technology, and the desire to meet patient expectations, despite the fact that most surveyed physicians believe that medical overuse is a problem that needs to be addressed (23–25). When considering the hierarchy of effectiveness of change concepts in improving quality of care, strategies that fall into the realm of education and training are known to be less effective than others (28), and that these passive interventions may create awareness but not necessarily prompt behaviour change (29). More active interventions such as in-person teaching or interactive tutorials (29) or 'forced function' interventions, such as one in Manitoba whereby US requests for evaluation of UDT were rejected with an explanatory letter by a radiology division (30), may help

to improve awareness of guidelines. Indeed, we found that our own radiology department performs a number of scrotal US based on requisitions from non-urologists, and perhaps a 'hard-stop' will be helpful here. Web-based interactive teaching sessions, which have become the norm in recent months, may also present an opportunity for our division to interact more directly with primary providers in our institution's referral area to better understand and discuss the reasons for US requests in these patients.

There are important methodological limitations to our study that are critical to acknowledge. Firstly, we may have ultimately under-calculated the total number of pre-referral US performed as we relied on documentation of these in the chart, and thus may have missed some that were not mentioned in the referring documents in any way. Secondly, our study evaluates only a sample of boys who had a confirmed diagnosis of UDT, which represents only a small portion of the total number of boys with a suspected diagnosis. We thus did not evaluate how many boys referred to our division who ultimately did not have UDT had US, and also have no way of knowing how many children are never referred to us at all on the basis of reassuring US findings in the community. Furthermore, these are the findings of a single institution, and may not be representative of referral patterns in Canada as a whole. Finally, certain subgroups contained very small numbers of clinicians, which limits the generalizability of the analysis.

CONCLUSIONS

Despite the availability of high-quality CPGs and the work of campaigns such as CW and CWC to reduce the overuse of low-value care, the number of patients undergoing US for UDT prior to referral to our institution remains high and largely unchanged over time. The majority of these investigations are requested by primary care physicians including paediatricians and family doctors. Further interventions need to be considered that allow for more active recommendation dissemination.

SUPPLEMENTARY DATA

Supplementary data are available at *Paediatrics & Child Health Online*.

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