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Non-Conformity in the Anatomical Description of the Duodenum and the Impact on Clinical Communication

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Abstract

Background: Communication errors are frequently identified sources of sentinel events and improving clinician communication is now a focus of patient safety organizations. Medical schools also have an opportunity and interest in improving clinical communication. One area for potential improvement is the miscommunication that can stem from lack of conformity in terminology student doctors learn from academic anatomists and terminology used by practicing physicians who serve as preceptors during third and fourth clinical years. While transitioning from medical school to a clinical setting, student doctors must relearn some clinical anatomical terms .The lack of uniformity in clinical terminology could lead to a miscommunication in the health care field and become detrimental to patient outcomes. Our goal is to determine and implement a universal standardized terminology for the duodenum.

Methods: We used nineteen references from six surgical, seven radiological, and six anatomical texts. We compared the resources' terminology in describing the parts of the duodenum for similarities and differences.

Results: The medical resources used five different anatomical descriptions of the duodenum among the three categories of anatomical texts. Additionally, individual sources within the same discipline of each category used different descriptions of the duodenum.

Conclusion: Student doctors and teaching clinicians would benefit fromthe use of easily identifiable landmarks instead of vague, conflicting anatomical terms for the duodenum to help solve communication errors. We recommend adoption of the American Association for the Surgery of Trauma duodenum nomenclature system, which divides the duodenum into four parts utilizing easily identifiable landmarks.

Keywords: DUODENUM; INTERDISCIPLINARY COMMUNICATION; HEALTH COMMUNICATION; SYSTEMATIZED NOMENCLATURE OF MEDICINE

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Introduction

There isa lack of conformity in the terminology student doctors learn from academic anatomists and terminology used by practicing physicians who serve as preceptors during third and fourth clinical years. A student will learn terminology in the first two years of medical education only to relearn and apply it using different medical terminology during clinical training (1).As an example of non-conformity, scholars use differing terminology for the anatomy of the prostate (2), the liver (3), and the heart (4).Medical academics, including Lachman and Pawlina, suggest that teaching medical studentsconsistent clinical terminology during their early medical education and into a clinical setting will help close the language gap (5). Scholars divide the development of anatomical terminology into five stages. Galen of Pergamon,

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in the early first century, initiated the first stage, which dominated ancient times. Galen used a limited number of ordinary words from the Greek and Latin languages to describe the anatomy and physiology of the human body. In the early 16th century, Vesalius, in his publication *Fabrica*, addedanatomically accurateillustrations of structures to the tome of anatomical descriptions. Jacobus Sylvius, of Paris, quickly followed Vesalius and opted to utilize descriptive terms and anatomical titlesto begin the third stage. In the fourth stage, Caspar Bauhin, of Basel, termed muscles based on their origins and insertions, revolutionizing anatomical understanding in the early 17th century. Anatomical textbooks, from the 17th to the 19th centuries, were authored by different people who described the same structures with different anatomical terms. The final stage began with the publication of the *NomicaAnatomica*at the end of the 19th century (6)Anatomical terminology was revised and edited repeatedly until the medical community adopted the current *TerminologiaAnatomica,* a collection of 7,635 anatomical terms which are considered standard internationally (7). More recently, clinicians have added their own terminology. For example, the term for the end of the spinal cord is commonly referred to by clinicians as the "epiconus." The only term approved by the *TerminologiaAnatomica* for this region is the "*conusmedullaris*." Authors, such as Pawlina and Drake, argue that both clinicians and anatomists should move forward and communicate with a common goal of unifying anatomic terminology that is useful for student doctors, anatomists, and clinicians (8).

Teamwork is an essential part of medical care – particularly in a clinical setting. A crucial element of the success of a team of healthcare professionals is communication. Miscommunication can lead to events that negatively affect patient outcome. Medical literature suggests that improved communication among physicians, nurses, pharmacists, etc. results in reduced hospitalization time and costs, improved coordination of care, enhanced health outcomes and quality of care, reduced medical errors, and enriched job satisfaction among healthcare workers (9).Poor communication is also one of the most common contributing factors to medical and surgical errors in the hospital (10) .Oneshared goal among healthcare professionals is to find common terminology that would improve communication, teamwork, and ultimately healthcare outcomes.

In a surgical setting, standard terminology can improve communication greatly. The Joint Commission, an association that sets safety standards and accreditation for healthcare organizations, estimates that roughly 80% of medical errors are due to miscommunication among medical staff when transferring patients. Many hospitals have implemented a program called I-PASS, a means of relaying information regarding patients to fellow healthcare workers while changing shifts, in an effort to rectify this miscommunication. This program caused a 23% decline in medical errors at one group of pediatric hospitals in 2008 (11).This is just one general example of how communication improved between healthcare workers for the benefit of the patient.

We are suggesting efforts that can be made to further reduce the rate of medical errors. Standardizing the terminology spoken by clinicians and student doctors would create more efficient communication and therefore increase the quality of patient care outcomes and decrease medical errors.

One specific example of anatomy with various terminologies used in clinical practice is the duodenum. The classification of the different parts of the duodenum is of great importance to clinicians. Injuries to different parts of the duodenum require different protocols for operative management. The American Association for the Surgery of Trauma (AAST) clearly describes the four parts of the duodenum and the surgical treatment required for injuries to each part (12).The anatomical description of the duodenum recommended by the AAST differs significantly from the anatomical descriptions of the duodenum found in the

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major texts used by student doctors during their first two years of preclinical training. Standardizing terminology will maximize the efficiency of communication of both student doctors and physicians in a clinical setting (13). In light of this argument, we recommend the universal adoption of the AAST nomenclature system in regards to the duodenum, and how this can be utilized in surgical management to unify, and as a result possibly impact clinical communication and improve patient outcome.

Methods

We reviewed the anatomical description of the duodenum in nineteen resources commonly used in medical school such as surgical, anatomy and radiology textbooks, as well as a variety of published articles. Of the nineteen sources, six were related to anatomy, six were related to surgery, and seven were related to radiology. Sourced published articles were found using PubMed, Google Scholar, and printed issues from journals.

After the sources were collected Table 1, titled "Comparison of Duodenal Descriptive Terminology by Text" was created. Each column represents theanatomical texts and their corresponding terminology of the duodenal portions as they are related to one another and used in clinical practice today. As a result, we divided the data into five columns to display common terminology from the nineteen sources.

To highlight the differences in communication among sources, we reviewed Table 1 alongside the American Association for the Surgery of Trauma (AAST)anatomical descriptions for comparison.

Anatomical terminology describing the duodenum not only differed among anatomical and clinical texts, but the nomenclature differed throughout the sources themselves. Five different descriptions of the duodenum were found for a possibility of communication errors. As an example, Jayaramanet al. describes the duodenum as having "superior, descending, horizontal, and ascending portions"as well as a "1st, 2nd, and 3rd portion and ends at the superior mesenteric artery (SMA)bulb" (14) as in columns two and three of Table 1. The AAST, in contrast, bases the nomenclature system on clearly identifiable anatomical structures that standardizes terminology, allowing for simplified communication among healthcare professionals.

The above methods did not include the use of human subjects, and therefore Institutional Review Board (IRB) approval was not required for this study.

Results

Table 1 illustrates the non-conformity of the

Table 1: Comparison of Duodenal Descriptive Terminology by Text

Superior	**Superior**	**1st Portion**	**Duodenal Cap/ Bulb 1st Part**	**D1**
Descending	Descending	2nd Portion	2nd Part	D2
Inferior	Horizontal	3rd Portion	3rd Part	D3
Ascending	Ascending	SMA Bulb (non consistent) Descending (non consistent)	4th Part	D4
* Dauber et al.	* Dauber et al.	^ Crown et al.	+ Boland et al.	^ Jacobs
* Drake et al.	+ Adam	+Federle and Raman	+ Butler et al.	and Luk
* Moore et all.	+ Jayaraman et al.	^ Iwasaki et al.	+ Gupta	
* Netter	*Rohen	+ Jayaraman et al.		
*TerminologiaAnatomica	*TerminologiaAnatomica	^ Karp et al.		
	^Thorek	^ Lawrence et al.		
		+ Wilcox et al.		

[a]*Anatomy texts; ^surgical texts; + radiology texts; [b]Results indicate the discrepancy between anatomical, surgical, and radiological literature terminology

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anatomic nomenclature system as it relates to the duodenum. This table exemplifies the obvious shortcomings of non-conformity in anatomic naming of the duodenum, which has resulted in the five columns that can lead to possible miscommunication within the healthcare field.

Within the various sources, separate portions of the duodenum are one-word classifications leading to open interpretation as to the boundaries of the segments and communication errors. Dauberand Feneis, Drakeet al., Mooreet al., Netter, and TerminologiaAnatomicadescribe the separate boundaries of the duodenum as superior, descending, inferior, and ascending (15-19). Dauber and Feneis, Adam et al.,Jayaraman et al., Rohenet al., TerminologiaAnatomica, and Thorekdescribe the separate boundaries of the duodenum as superior, descending, horizontal, and ascending(14, 15, 19-22).Crown et al., Federle and Raman, Iwasakiet al., Jayaraman et al., Karp et al., Lawrence, and Wilcoxet al., describe the separate boundaries of the duodenum as 1st, 2nd, 3rd portions, with the 4thportion ending at the SMA bulb(14, 23-28). Boland, Butleret al., and Gupta et al. describe the separate boundaries of the duodenum as the first part being the duodenal cap/bulb 1st, 2nd part, 3rd part and a 4th part (29-31). Lastly, Jacobs and Lukdescribe the separate boundaries of the duodenum as having D1, D2, D3 and D4 segments (32).

In contrast, differences exist between Table 1 "The Comparison of Duodenal Descriptive Terminology by Text" and the American Association for the Surgery of Trauma (AAST). One difference includes boundaries where specific portions of the duodenum begin and end. As demonstrated by the AAST, this source defines the duodenum as having four portions. Portion one begins at the pylorus and ends where the bile duct crosses the duodenum. Portion two is defined as beginning at the bile duct and ending at the ampulla of Vater. Portion three begins at the ampulla of Vater and ends at the anterior crossing of the superior mesenteric vessels. Portion four begins at the superior mesenteric vessels and ends at the suspensory muscle of the duodenum where the bowel continues as the jejunum. Unlike the descriptions in the referenced anatomical texts, the AAST description relies on clearly identifiable anatomic structures and is the nomenclature system used in clinical publications regarding the duodenum (12).

Furthermore, the beginning and ending boundaries of the duodenum are not clearly identified using anatomical landmarks in the Table 1 sources. AAST's first portion is described as comprising approximately five centimeters between the pylorus, where it begins, and the bile duct crossing the duodenum, where it ends (12).Rather, sources contained in Table 1, describe the ascending, or related first portion, with no clear boundaries. This identification is markedly less helpful than descriptions using the AAST anatomical landmarks to a surgical resident who is attempting to communicate an injury to the duodenum to an attending physician.

Conclusion

Anatomical language used by physicians in clinical practice at times conflicts with anatomical descriptions and terminology taught in medical school resulting in miscommunication. Student doctors in clinical years are faced with unfamiliar anatomical language during rotations of varying disciplines. Student doctors would greatly benefit by replacing vague, conflicting anatomical descriptions with those that use straightforward identifiable landmarks. We recommend universal adoption of the AAST duodenum nomenclature system, which we believe would result in improved clinician to clinician communication.

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Conflict of Interest

The author declares no conflict of interest.

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