ORIGINAL PAPER

The Case Anatomical Knowledge Index (CAKI) as a Tool for Selecting Clinical Cases for Clinically Oriented Anatomy Teaching: Approach and Content

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ABSTRACT

For medical education to be valid and reliable for clinical practice there must be concordance between what students learn and the demands of their future clinical responsibilities. The objective of this paper is to describe a technique that brings together disease prevalence and the potential of a disease/clinical case to foster anatomy learning for selecting diseases/clinical cases for clinically oriented anatomy teaching (COAT).

In the study reported disease prevalence was compiled from national Health Management Information System (HMIS) records from three consecutive years and analysis of clinical audit records from three hospitals, including the national referral hospital, and one urban district health management team for a 5-yr period. The most prevalent diseases/cases in general surgery, surgery sub-specialty, medicine, paediatrics, and obstetrics and gynaecology were then scored and ranked using the Case Anatomical Knowledge Index (CAKI). The CAKI is a Guttman scalogram analysis index used to evaluate the anatomy embedded in a clinical case.

The study identified high-prevalence high-CAKI diseases/cases including, for example: for general surgery (intestinal obstruction, head injury, inguinal hernia); surgery sub-specialties (hydrocephalus, congenital talipes equinovarus, dental caries); medicine (pulmonary tuberculosis, meningitis, heart disease); paediatrics (congenital neural tube, and heart defects, meningitis); obstetrics and gynaecology (normal delivery, ectopic pregnancy). In combination, disease prevalence and potential for anatomy learning, can promote validity and reliability of anatomy teaching when we consider practical real life experiences of clinicians. The findings could have practical applications for anatomy educators in selecting clinical cases for teaching anatomy.

Key Words: Anatomy, Case Anatomical Knowledge Index (CAKI), Clinical, Clinically Oriented Anatomy Teaching (COAT), Case, Disease, Prevalence

INTRODUCTION

For medical education to be valid and reliable for clinical practice there must be concordance between what students learn and the demands of their future clinical responsibilities. When there is a disconnect about what students learn in medical schools and what they need for clinical practice a radical rethink of curricula design is indicated. In anatomy the mainstay of curriculum delivery is the lecture method and practicum (dissection and microscopic). This is true for many African countries and Zambia in particular. Additionally, anatomy is taught either regionally or by body systems. In clinical settings, however, anatomy is encountered in the context of a clinical problem (diagnostic, investigative, or for treatment). This is why case based teaching was introduced in problem based learning curricula in many medical schools the world over[1]. However, in the literature some authors[2,3] have expressed concerns about the scope and depth of anatomy learned when case based teaching is used.

In practice, certain diseases are more likely to be encountered than others and they each present distinctive demand for knowledge of anatomy to the clinician. This paper describes a technique that brings together disease prevalence and the potential of a disease/clinical case to foster anatomy learning. The technique can be used to select diseases/clinical cases for use in clinically oriented anatomy teaching (COAT).

METHODS

The Case Anatomical Knowledge Index (CAKI) is a composite measure (an index), analogous to the Glasgow Coma Scale, the APGAR score and Bishop's Score. The CAKI is a tool for evaluating the detail of anatomy that would be required for three clinical categories, a) to understand diagnosis and concepts about the disease; b) interpret investigations and undertake clinical procedures; and c) plan and implement treatment plan. The CAKI score, therefore, is scored as a three domain operation, i.e. n(DC)+n(I)+n(T) where n(DC), n(I) and n(T) represent the clinical categories a), b), and c) stated above, respectively. For each clinical category the possible scores range from 1-5. The CAKI is shown in Table 1. In practice, certain diseases are more likely to be encountered than others, however each must be assessed for demand for knowledge of anatomy to the clinician. As such, disease prevalence was first evaluated in our study.

Table 1, Case Anatomical Knowledge Index (CAKI) Scorecard

Clinical Case/Condition for Consideration:					
Key	Universe of Attributes	Knowledge of anatomy required for:			
		Diagnosis and concepts	**Investigations**	**Treatment**	**Total**
Very Low = 1	Knowledge of parts of the body using lay terms Knowledge of general functions of structures of the body				
Low = 2	All of above AND Knowledge of specific mechanism of function of structures in the body Knowledge of parts of the body using anatomical terms				
Average = 3	All of above AND Knowledge of specific and accurate developmental anatomy of structures of the body Ability to identify tissue types, named blood vessels and nerves				
High = 4	All of above AND Knowledge of blood supply/drainage and nerve supply of structures in body Knowledge of specific and accurate topographical relationships of body structures				
Very High = 5	All of above AND Knowledge of basic tissue types of the body Ability to identify specific structures accurately in topographical context				
	Enter Score Here				

Scoring: For each of the domains (diagnosis & concepts; investigations; treatment) follow the column dow nwards and select, from the first two columns on the left, the corresponding score, than enter your score in the last row. The three scores on the last row are totalled to obtain the total CAKI Score.

Inventory of Disease Prevalence

Disease prevalence was compiled from national Health Management Information System (HMIS) records from three consecutive years. The HMIS compiles data stepwise, i.e., from health institutions, to the district, to the province and finally to the national Monitoring and Evaluation Unit. Data is collated from mostly public and faith-based institutions in all the 72 districts. Additionally, for a five year period, institutional records from the national referral hospital (University Teaching Hospital), a regional hospital (Ndola Central Hospital), a provincial referral hospital (St. Francis in Katete), and an urban district (Lusaka) were reviewed. The institutional records included clinical audit reports from departments of medicine, obstetrics and gynaecology, and surgery; outpatient records; and morbidity and mortality reports. Data from the various sources was made uniform and comparable by transferring the information onto a standardized disease prevalence data form. Categories for the form were generated from data collected in the pilot phase of the data collection exercise. It is noteworthy that data from HMIS is collated into more general categories in which specificity is lost whilst those collected on the form maintained specificity of disease category, where possible. The HMIS because it classes disease in very broad groups within, may have a weakness for which the CAKI may vary widely within each broad group. To minimize this limitation prevalence figure from more specific disease categories were selected over general categories.

Ranking of Diseases Using the Case Anatomical Knowledge Index

The Case Anatomical Knowledge Index (CAKI) is, essentially, a rubric for evaluating the anatomy content embedded in a clinical case. The CAKI is an Index constructed using Guttman scalogram analysis. The development and validation of the Index have been described in another paper[4]. The most prevalent diseases were each evaluated for three clinical categories describe earlier. Given the three domains assessed the maximum possible score was 15 if all domains are rated very high (5). From a scaling point of view the scores are ordinal in nature[5]. Scores of 12 and above were considered very high and represented substantial detail of anatomy for a clinical case. This is because a score of 12 represents an average score of 4 for each domain or at least scores of 5 or 4 in at least two domains. A score of 9 11 is high, and scores of 8 and below are low for the purposes of directing learning issues in anatomy. A high score in one domain in spite of a low overall CAKI score may warrant study of anatomy for that domain alone for a clinical case/condition. The CAKI score is interpreted bearing in mind the specific objectives; identification of clinical cases that require substantial detail of anatomy in order to prioritize and identify anatomical learning issues.

RESULTS

General Surgery Cases

The most common surgical conditions, with high CAKI scores, seen in this study, included peri-anal pathology (anal fistulae, anal fissures, haemorrhoids, and abscesses), fractures of the ulna and radius, head injury, fractures of the tibia and fibula, intestinal obstruction, inguinal hernias and shoulder dislocations. Figure 1 shows the consolidated number of common surgical cases with highest CAKI scores.

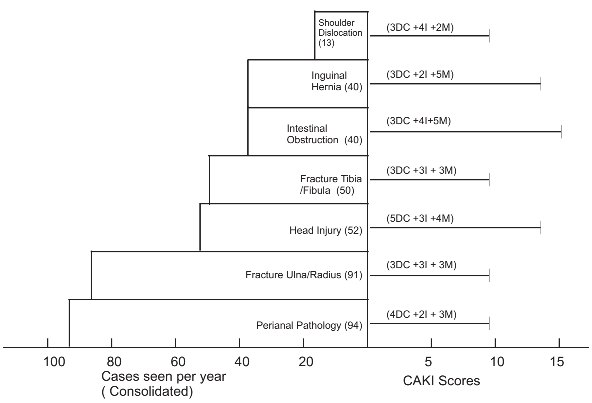

Figure 1, High-Frequency and High-CAKI Score General Surgery Cases

* Component scores for CAKI; DC = Diagnosis & Concepts, I = Investigations, M = Management

Surgery Sub-specialty Cases

The higher CAKI scoring conditions included dental caries, hydrocephalus, congenital talipes equinovarus, fracture mandible, congenital hernia, prostate disease (benign prostate hypertrophy and cancer of the prostate), burns/contratures, urethral strictures, cleft lip and/or palate, and cataracts. Dental caries were by the far the commonest, whilst hydrocephalus, congenital talipes equino varus, and cleft lip/palate had the highest CAKI scores at 13 each. Figure 2 shows the relation of frequency and CAKI scores for the surgical sub-specialties clinical conditions.

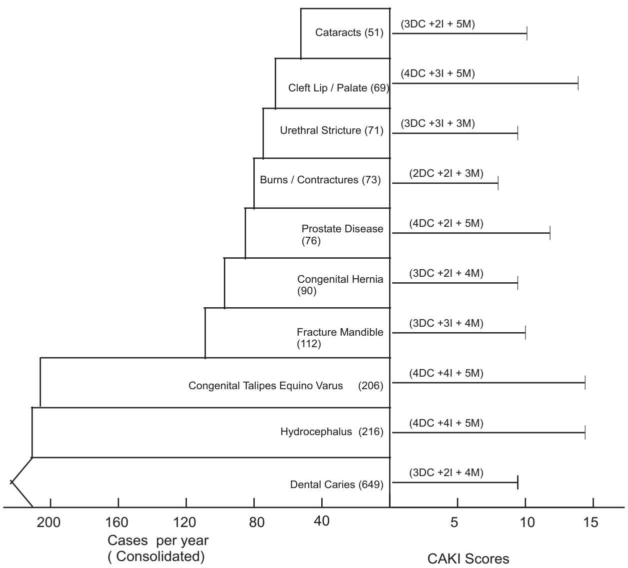

Figure 2, High-Frequency and High-CAKI Score Surgery Sub-specialty Cases

Medical Cases

The medical conditions had much higher frequencies but tended to have lower CAKI scores. Amongst the higher CAKI scoring conditions, pulmonary tuberculosis was the commonest, followed by upper respiratory tract infections, meningitis, pneumonia and heart disease. The highest scoring for CAKI was heart disease (CAKI = 8). Figure 3 shows the relation of frequency of cases and the CAKI scores.

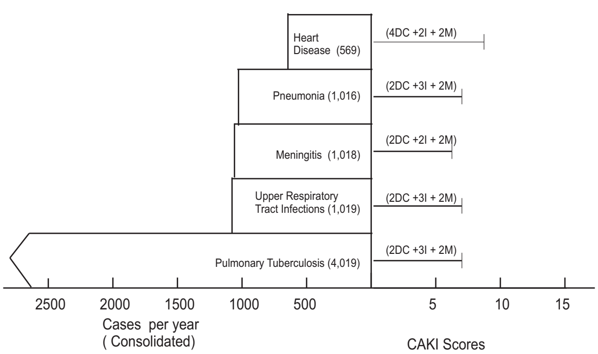

Figure 3, High-Frequency and High-CAKI Score Medical Cases

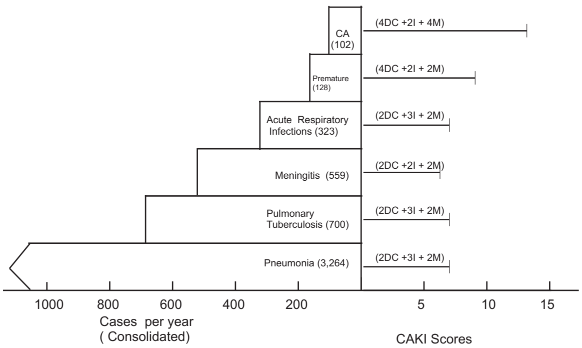

Figure 5, High-Frequency and High-CAKI Score Obstetric/Gynaecology Cases

Paediatric Cases

The type of diseases seen in paediatrics were similar to the cases in medicine except for the premature cases and congenital abnormalities. Pneumonia, pulmonary tuberculosis, meningitis, acute respiratory tract infections were the commonest higher scoring CAKI cases. Congenital abnormalities (mostly neurotube defects) as a group had the highest CAKI score (13). Figure 4 shows the relations of frequency of cases and CAKI scores.

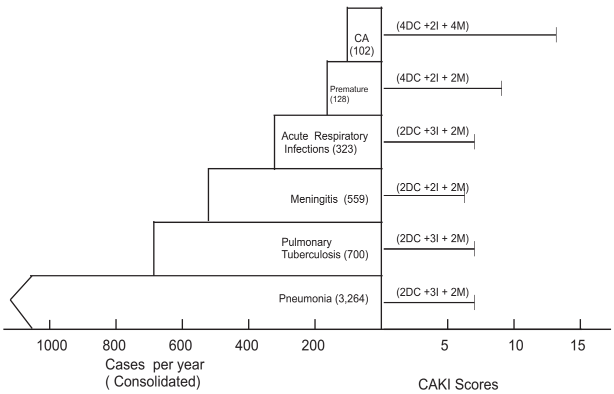

Figure 4, High-Frequency and High-CAKI Score Paediatric Cases
(Note: CA = Congenital Abnormalities)

Obstetrics and Gynaecology Cases

In obstetrics normal delivery was by far the commonest and had CAKI score of nine. The cancer of the cervix and ectopic pregnancies were the two cases with CAKI scores higher than 10. In both cases management (surgical operation) was the determinant for higher scores contributing 4 or 5.

Summary of CAKI Scores in Clinical Specialties

The overall summary of high-frequency high-CAKI cases by specialty are shown in Table 2 below.

Table 1, Case Anatomical Knowledge Index (CAKI) Scorecard

DISCUSSION

Prevalence of Disease

The UK General Medical Council's “Tomorrow's Doctors” [6] gave important impetus to reform in anatomy teaching in the UK and many parts of the world. The GPEP Report[7] gave similar impetus to reform in anatomy teaching in the U.S.A. Many

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