A Web Based Software System for Bone and Joint Infections in Children

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ABSTRACT

This paper presents a web based system for recording, monitoring, and studying pediatric patients with bone and joint infections. A rapid prototyping method was followed based on Adobe Fireworks CS3. The database is developed in MySQL. The application is based on PHP and JavaScript. The system’s architecture and design are based on three principles; “to follow the way Medical Doctors think and work,” “to make Medical Doctors work easier and faster,” and “to record scientifically validated data elements for research.” The developed system is “doctor-friendly” because it is based on classifications and knowledge grouping specialized on children infections on bones and joints, using the experience of Medical experts on the field. The benefits of the system expand to Patients, Medical Doctors, HealthCare Systems, Research & Science and every day clinical practice.

Keywords: Children Infections, Clinical Informatics, Clinical Software, Medical Informatics, Osteomyelitis in Children, Septic Arthritis, Web-Based Software

DOI: 10.4018/ijudh.2012100108
INTRODUCTION

Bones’ and joints’ infections among children are usually caused by bacteria, leading to prolonged antibiotic administration and hospitalization. The management of children with diagnosed or suspected infections in bones and joints remains a challenge. However, over the past 15 years, increasing microbial virulence combined with antibiotic resistance as well as advances in imaging techniques and diagnostic molecular microbiology has led to an increased quantity and variety of new medical data (Kaplan, 2005).

Infections of bones and joints in children occur haematogenously in most of the cases, although injury to the site of the bone infection is usually referred in the history. Therefore, the role of injury in the pathogenesis of bones and joints infections in children remains unclear (Stott, 2001).

By far, the most common bacterial pathogen causing osteomyelitis in children is Staphylococcus aureus in all age groups (Krogstad, 2004). Group A Streptococcus (Ibia, Imoisili, & Pikas, 2003), Streptococcus pneumonia (Bradley, 2005), and the emerging pathogen Kingella kingae (Yagupsky & Dagan, 1997) are the next most common organisms in infants and children. The list of pathogens continues, in parallel with a variety of predisposing risk factors leading to an area for further research.

Infections of bones and joints tend to be more diffuse in infants because of low anatomic barriers to limit the spread of infection (Kaplan, 2005). In addition, new manifestations of acute osteomyelitis are associated with clones of community-associated methicillin-resistant S. aureus (CA-MRSA) carrying the genes encoding Panton-Valentine leukocidin (pvl) (Kaplan, 2005; Sdougkos, Chini, & Papanastasiou, 2008).

In almost half of children with acute osteomyelitis, a bacterial etiology is never established (Floyd & Steele, 2003). Therefore, polymerase chain reaction (PCR) may become an important diagnostic tool (Moumille, Mercx, & Glorion, 2003).

The empiric regimens and the modification of antibiotic treatment once an organism is isolated and antibiotic susceptibilities are determined, is also a domain for research. For example, there is little information on the use of trimethoprim-sulfamethoxazole in the treatment of invasive MRSA infections (Adra & Lawrence, 2004) moreover the role of daptomycin in the treatment of MRSA osteomyelitis in children is unclear (Bradley, 2005).

Starting from pathogenesis to microbiology, clinical manifestations, diagnosis and treatment, a variety of issues still remains unclear requiring a systematic and more detailed medical data collection for further research. The amount of information required or worthy for medical research is increasing and as a result, essential elements are often not recorded and lost.

In addition, there is significant variation in terminology and data reporting among different medical specialties that treat bone and joint infections in children, such as Paediatrics and Children Orthopaedics, or even among medical doctors of the same specialty.

This paper presents a web based system for recording, monitoring and studying children with infections of bones and joints that requires almost no text entry and editing and could be accessed through any electronic device with an internet connection and a web browser. Furthermore, our goal was to create a system containing most of the scientifically validated data elements, reducing omissions and improving consistency by standardising the reporting language among medical doctors. One of the benefits lays in the output of the system that contains all of the entered scientifically validated elements that are easily exploited for medical research issues using standard SQL commands. In addition, the system’s interface architecture is based on the traditional medical way of thinking and acting, (starting from History to Physical Examination, then to Laboratory Tests and Imaging Examinations, etc.) providing a “doctor-friendly” system. Therefore, it requires almost no training, helping Medical Doctors to work easier and in a faster way.

The remainder of the paper is organized as follows. First, the methods used for the design, development, testing and validation
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