The Availability and the Adherence to Pediatric Guidelines for the Management of Syncope in the Emergency Department

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Objective To evaluate the impact of the 2009 Italian pediatric clinical guidelines on the management of syncope.

Study design A retrospective study of patients who presented to the Emergency Department (ED) of Bambino Gesù Children's Hospital with syncope during the 2 years before and then for 2 years after the establishment of the Italian pediatric clinical guidelines. Implementation of the clinical guidelines included educational seminars, additional training of health care workers, and the availability of clinical guidelines and its algorithms on ED examination rooms.

Results We studied a population of 1073 patients (n = 470 vs n = 603). Most patients had neurocardiogenic syncope with a greater increase in postimplementation period (n = 241, 51.3% vs n = 454, 49.8%); we also noticed a parallel reduction of the number of patients with undefined syncope (30% vs 8.3%). We observed an increase in electrocardiogram (n = 328, 69.8% vs n = 512, 85.1%; $P < .001$), a reduction in electroencephalogram (n = 54, 11.5% vs n = 25, 4.1%; $P < .001$), and computed tomography scan/magnetic resonance imaging utilization (n = 26, 5.5% vs n = 8, 1.3%; $P < .001$). In addition, there was a significant reduction of hospital admission rates (n = 195; 41.5% vs n = 116, 19.2%; $P < .001$). The time period was significantly associated with improvements in all procedures at the multivariate analysis.

Conclusions Providing practitioners in the ED with age-oriented clinical guidelines increased the efficiency of clinical management of pediatric syncope. Our study demonstrated that the implementation of pediatric clinical guidelines on syncope improve diagnosis, reduce hospital admissions, and decrease the use of unnecessary diagnostic tests. *(J Pediatr 2014;165:967-72)*.

Pediatric syncope is a common reason for presentation to the emergency department (ED). Although syncope has many underlying causes, the most frequent form is a benign entity, neurocardiogenic syncope. However, syncope can also be the first clinical manifestation of a significant cardiac, neurologic, or metabolic disease.[1,2] In a few cases, syncope may be the first sign of a cardiovascular problem that includes a risk for sudden cardiac death.[3]

The estimated prevalence of syncope in children is 25.8/100 000[4] and 15% of children will have a syncopal episode before the age of 18 years.[5] Syncope is responsible for 0.4%-1% of all visits to the pediatric ED[6,7] and 3.4%-4.5% of all cardiology referrals.[8] Thus, syncope is a major challenge for practicing physicians with significant resource utilization and increasing expenses because of concern of misdiagnosing a potentially fatal condition.[6,9,10]

Despite effective primary care strategies and improved interventions to reduce the number of tests ordered for patients with syncope, there is an overall over-utilization despite their low diagnostic yield. Conversely, despite the fact that the electrocardiogram (ECG) is useful in the diagnosis of underlying cardiac disease, this procedure is still underused as part of the work-up in the ED.[7,11]

Consequently, several clinical guidelines and diagnostic algorithms have been developed for optimizing the diagnostic evaluation of syncope and the use of a diagnostic protocol has improved the management of syncope in adults.[12-15] However, these clinical guidelines are designed for adults and are not completely applicable to the pediatric population.

In 2005 in Italy, greater than 4000 hospital admissions of children up to 14 years of age carried the main diagnosis of syncope (*International Classification of Diseases, Ninth Revision, Clinical Modification*: 780.2). Of these patients admitted, more than 2800 were between 5 and 14 years of age. The average hospital stay was 3 days for a total of almost 12 000 hospital days.[16]

In 2009, comprehensive Italian clinical guidelines on pediatric syncope were developed and published as the result of a collaborative effort of several relevant societies.[16] The aim of this study was to investigate the impact of the implementation of Italian pediatric clinical guidelines on the management of children with syncope in the ED of a tertiary referral pediatric hospital. The study included an

CT	Computed tomography
ECG	Electrocardiogram
ED	Emergency Department
EEG	Electroencephalogram
MRI	Magnetic resonance imaging

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evaluation of specific outcomes, utilization of specific diagnostic tests, clinical characterization of undefined syncope, and admission rates to hospital comparing data prior and after implementation of clinical guidelines.

Methods

With institutional review board approval, we conducted a retrospective study of all patients, aged 3 months to 18 years, who presented with a primary complaint of syncope to the ED of the Bambino Gesù Children's Hospital in Rome. The time periods reviewed included 2004-2005, prior to implementation of clinical guidelines, compared with the postimplementation period of 2010-2011. The ED in our institution, an urban tertiary pediatric referral hospital, has over 50 000 visits per year. In the years 2004-2005, an average of 40 children per month presented with syncope as a primary complaint, and that number increased to 50 per month in the years 2010-2011. We reviewed the clinical charts of all patients identified with a diagnosis of "syncope."

Syncope was defined as a sudden and transient loss of consciousness and postural tone, with or without prodromal symptoms followed by a phase of spontaneous and rapid recovery.[12-14,16] Patients with a loss of consciousness associated with traumatic brain injury, cerebral infection disease such as meningo-encephalitis, or children with a prolonged state of unconsciousness were not included in the study. The following data were collected from each medical record: age, sex, triage code, family and personal history, prodromal period, trigger events, symptoms, number of episodes, physical examination findings, cardiologic and neurologic evaluations, ECG, electroencephalogram (EEG), blood tests, radiologic tests such as computed tomography (CT) scan, magnetic resonance imaging (MRI), cardiologic investigations, final diagnosis, hospital admission, and duration of hospitalization, as applicable.

All studied patients were evaluated at the entrance of the ED by a nurse with the assignation of a severity or triage code with a different waiting time as follows: "red," immediate, no waiting time; "yellow," very urgent; "green," urgent; and "white," nonurgent, patients who attend visit after previous code categories. The assignment of triage code was based on clinical appearance and symptoms, personal and family history, and vital signs.

The diagnosis and clinical categorization of the patients with syncope were made by ED physicians. The patients were diagnosed as having syncope and then classified into diagnostic categories that were established before data collection according to published criteria[6,17]: (1) neurocardiogenic syncope; (2) breath holding spells; (3) cardiac syncope comprising structural and electrophysiologic abnormalities; (4) neurologic disorders including seizures, headache, and cerebrovascular disease; (5) psychogenic problems such as hysteria/conversion, depression, panic attacks; and (6) undefined syncope.

In our pediatric ED, before the development of the Italian pediatric clinical guidelines, patients with syncope were investigated and managed according to the international adult clinical guidelines. The preparation of Italian clinical guidelines on pediatric syncope through a multidisciplinary and multisocietary process started in 2006 and a final document was published in 2009,[16] approved by panel of experts from all Italian Scientific Societies with relevance to pediatric syncope. The development of clinical guidelines followed standard procedures endorsed by the Italian National Heath Institute (http://www.snlg-iss.it/home_en#). Since publication, implementation of the pediatric clinical guidelines in our hospital included educational seminars for health care workers and availability of the written clinical guidelines and its algorithms on all computers in the ED medical examination rooms. In addition, we used a training simulation of various scenarios of patients with different types of syncope, which was attended by all healthcare professionals working in the ED. Moreover, we introduced, during the postimplementation period, that the study coordinator (U.R.) or 2 other doctors (S.S. and A.R.), would provide adherence support, daily attendance, and supervision of implementation of clinical guidelines in the ED, as well as resolve any problems that might inhibit GC implementation. The same implementation procedure was applied by the Department of Cardiology by 2 other study participants (F.D. and U.G.) and second level tests were agreed upon with cardiologists and other specialists. During the implementation period, we stressed the recommendations contained in the Italian clinical guidelines,[16] with particular regard to the initial diagnostic workup (**Table I**; available at www.jpeds.com), the correct identification of elements that might indicate cardiac disease as a cause of syncope as suggested by Massin,[18] and the utilization of algorithms for a diagnostic approach to syncope (**Figure**).

Statistical Analyses

Categorical variables were compared using the χ^2 test, and continuous variables were compared using Student *t* test after reviewing for appropriateness. We applied logistic regression models to assess the effect of clinical guideline implementation and adjusted for potential confounders in enrolled children (ie, admission into hospital, length of stay >2 days, ECG in the ED, assignment of a definite diagnosis, head CT scan). AORs and 95% CIs were used as measures of effect and statistical significance was set at $P < .05$.

Results

We identified 1073 patients (52.2% female and 48.8% male) admitted with syncope in the study during the pre- (470 patients) and post-implementation (603 patients) periods. Male to female ratio was similar between the 2 groups, and mean age was greater during the postimplementation period (**Table I**). In regard to triage code, the proportion of very urgent or yellow codes increased in the group after clinical guideline implementation (2.6% vs 12.1%; **Table II**).

Before the pediatric clinical guidelines were implemented at our hospital, 195 of the patients admitted to the ED with