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Improving the Quality of Paediatric ECG Interpretation

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Abstract

Aims

Our aim was to complete an audit loop and identify whether implementing a paediatric ECG checklist improved the documentation and therefore the quality of paediatric ECG interpretation. We designed a paediatric ECG and education proforma in a Paediatric Emergency Department and incorporated it into daily practice.

Methods

We audited the medical records of children presenting with clinical indications for ECG. We included 40 records before and 40 records after the introduction of a paediatric ECG interpretation checklist.

Results

We assessed 10 items of documentation of which 8 related to the wave-form. Recording of these ranged from 0-65% before and from 95-100% after the checklist.

Conclusion

An intervention to introduce a paediatric ECG checklist, including education proforma, demonstrated significant improvement in the interpretation and documentation of a paediatric ECG. We recommend the use of this checklist in primary care and hospital settings.

Introduction

The emergency department is often the first port of call for several situations when an electrocardiograph (ECG) takes the vital role in the investigation of underlying paediatric pathologies, i.e. arrhythmias, syncope, submersions, seizures, arrest, ingestions, brief resolved unexplained episode, breath holding spells, palpitations and chest pain.[1] Consistent interpretation of a paediatric ECG can be variable among physicians, and studies have shown that competence of ECG interpretation can be below the required standards.[2] As a child's heart varies anatomically by age, size and ventricular dominance, normal ranges for ECG parameters vary from those of adults. There are constant anatomical changes of the paediatric heart influenced by age, size, and ventricular dominance.[3] Interpretation can be subpar in an emergency setting secondary to various factors related to doctor (e.g., experience) as well as patient history (i.e., past history of a particular arrhythmia).[4] An appropriate system of interpretation of the ECG and detailed documentation is required. We aim to demonstrate an audit loop related to the introduction of a paediatric ECG checklist and education proforma.

Methods

In the Department of Paediatric Emergency Medicine, Children Health Ireland (CHI) at Crumlin, a 2-page Paediatric ECG Checklist and Education Proforma was designed and introduced after being reviewed and approved by consultants in the Department of Cardiology and Emergency Medicine.[5] Multiple teaching sessions were arranged in the department initially and then we also contacted consultants in emergency departments of other hospitals. Finally, we made the checklist accessible online on hospital's website and mobile app.

We assessed clinical records of patients presenting with symptoms of chest pain, dizziness, palpitations, loss of consciousness, fainting episode, seizure/vaso-vagal episode and toxicological presentations for documentation of ECG. An ECG reporting dataset was designed and used to audit ED clinical records (n=40) in October 2019. The ECG Checklist and Education Proforma was introduced, and the audit was repeated (n=40) in November 2019.

Summary statistics were presented as proportions for categorical outcomes. Data analyses were performed using Microsoft Excel.

Results

The documentation of ECG findings, either normal or abnormal, was suboptimal before introducing the checklist (Table 1). Of particular note, the ST-segment status was not documented in any of the initial 40 ED notes; moreover, the ECG's final impression was recorded in only 26 notes (Table 1).

After utilisation of the checklist, a rising trend of documentation of all ECG waves, segments, intervals, and axis was noted as the percentage rose to 100% for most of the findings (p<0.001 for all domains) (Table 1).

Table 1: Pre and Post Intervention Documentation of Electrocardiogram Findings.

Findings	*Number (Percentage)*	
	BEFORE Use of checklist	*AFTER Use of checklist*
Clinician's Name/ Designation	**3 (7.5 %)**	**38 (95.0 %)**
Signatures & IMC number	**19 (47.5 %)**	**38 (95.0 %)**
Type of Rhythm	**18 (45.0 %)**	**39 (97.5 %)**
PR interval	**5 (12.8 %)**	**40 (100 %)**
QRS Axis	**3 (7.5 %)**	**38 (95.0 %)**
PR length	**4 (10.0 %)**	**39 (97.5 %)**
QTc	**14 (35.0 %)**	**39 (97.5 %)**
ST Segment	**0 (0 %)**	**40 (100 %)**
T-wave	**2 (5.0 %)**	**40 (100 %)**
Final Impression	**26 (65.0 %)**	**40 (100 %)**

Abbreviations: IMC: Irish Medical Council, QTc: QT-interval Corrected.

Discussion

This audit loop clearly described a marked improvement in the quality of documentation of the findings and establishes the benefit of a comprehensive and user-friendly tool for paediatric ECG checklist interpretation. This audit loop was completed within the same NCHD rotation period and same cohort of doctors were working in the department before and after the checklist was introduced. Studies have revealed a significant discordance in the interpretation of ECGs between emergency medicine residents and cardiologists, with suggestions that the failure to interpret the ECG accurately was a major factor in patient management errors.[4,6] The paediatric ECG checklist and education proforma helped physicians analyse and report findings while being an education resource in parallel. This practice helped identify patients requiring cardiology services. Furthermore, it may potentially reduce unnecessary referrals, such as for sinus arrhythmias or incorrect QTc measurements. This ECG checklist and education proforma works on two principles; one to educate physicians and second to improve interpretation competency and documentation. We therefore recommend the use of this checklist in primary care and hospital settings.

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https://www.noca.ie/news/nocas-annual-conference-2020-reaches-record-high-with-over-500-in-attendance [Accessed: 07- Sep- 2020]

Declaration of Conflicts of Interest:
No conflicts of interest.

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