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ChatGPT versus human memory: A Historical Exploration of the 4 Hs and 4 Ts

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Dear Editor

Recently, we have inquired about the origins of the mnemonic '4 Hs and 4 Ts' used to recall the reversible causes of cardiac arrest (CA). Despite searching medical databases, consulting the guidelines of the European Resuscitation Council (ERC)¹ and of the American Heart Association and publications of the International Liaison Committee On Resuscitation (ILCOR), the answer remained elusive. We even queried ChatGPT and received the following output: "The Hs and Ts concept for reversible causes of CA has been a part of medical education for many years, and it doesn't have a single originator or specific educator or scientist associated with its creation. It has evolved as a collective teaching tool in the field of emergency medicine and resuscitation, and its use is widespread in medical training to help healthcare providers remember potential reversible causes of cardiac arrest. So, there isn't a single individual to credit for its inception; rather, it has developed over time through the contributions of many healthcare professionals in the field. The real answer at your question was in human memory and experience". We continued our global search, using ERC's social media, and found the term "correctable causes" in a 1986 guideline but without a mnemonic². Our efforts led to a key reference from ILCOR³. The most enlightening response came from Prof. Walter Kloeck: "At an

ILCOR meeting, as Chairman of the Resuscitation Council of Southern Africa, the Advanced Life Support Working Group of ILCOR were discussing possible causes of cardiac arrest, particularly pulseless electrical activity (PEA). I suggested using a memory aide of “5 Hs and 5 Ts”, which the Committee favoured and suggested that this should be published for students and clinicians to use. This was published in *Resuscitation*⁴, together with a simple 10-step “zigzag” diagrammatic approach, which we still teach today, 28 years later! The Hs and Ts memory aide was subsequently used in the ILCOR Universal ALS Algorithm, published in *Resuscitation*³ and *Circulation*. Thereafter, several resuscitation councils worldwide added and subtracted various Hs and Ts over time, some using the diagram on their ICU charts for memory assistance.” From 1995 until today, there have been several proposals for the use and modification of the 5 Hs and 5 Ts, but the insight has endured. We felt it was important to acknowledge and reinforce our gratitude to Prof. Kloeck and to the initial group that suggested the use of this mnemonic aid (Figure 1). This made us realize the urgency of researching, constructing, and preserving the memory of certain historical facts difficult to recover later. This could be a significant technological and research challenge for the future. As Leonard Nimoy wrote in his last tweet⁵: “A life is like a garden. Perfect moments can be had, but not preserved, except in memory. LLAP”

Acknowledgements

We want to thank Prof. Walter Kloeck for the inspiration he provided and we want to celebrate this to make known to the new generations the origin of an educational tool that has stood the test of time.

Conflict of Interest Statement

No relationship exists between the author and any commercial entity or product mentioned in this manuscript that might represent a conflict of interest. No inducements have been made by any commercial entity to submit the manuscript for publication. All within 3 years of beginning the work submitted. FS is the Chair-Elect of the European Resuscitation Council, Chair of the ILCOR Social Media Working Group and member of the ILCOR Basic Life Support Task Force. JP and MM have no conflict of interest to declare. KM is the Chair of the European Resuscitation Council, Chair of the ILCOR Digital Communications Working Group and member of the ILCOR Education Implementation and Teams Task Force.

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A Practical Approach to P.E.A.

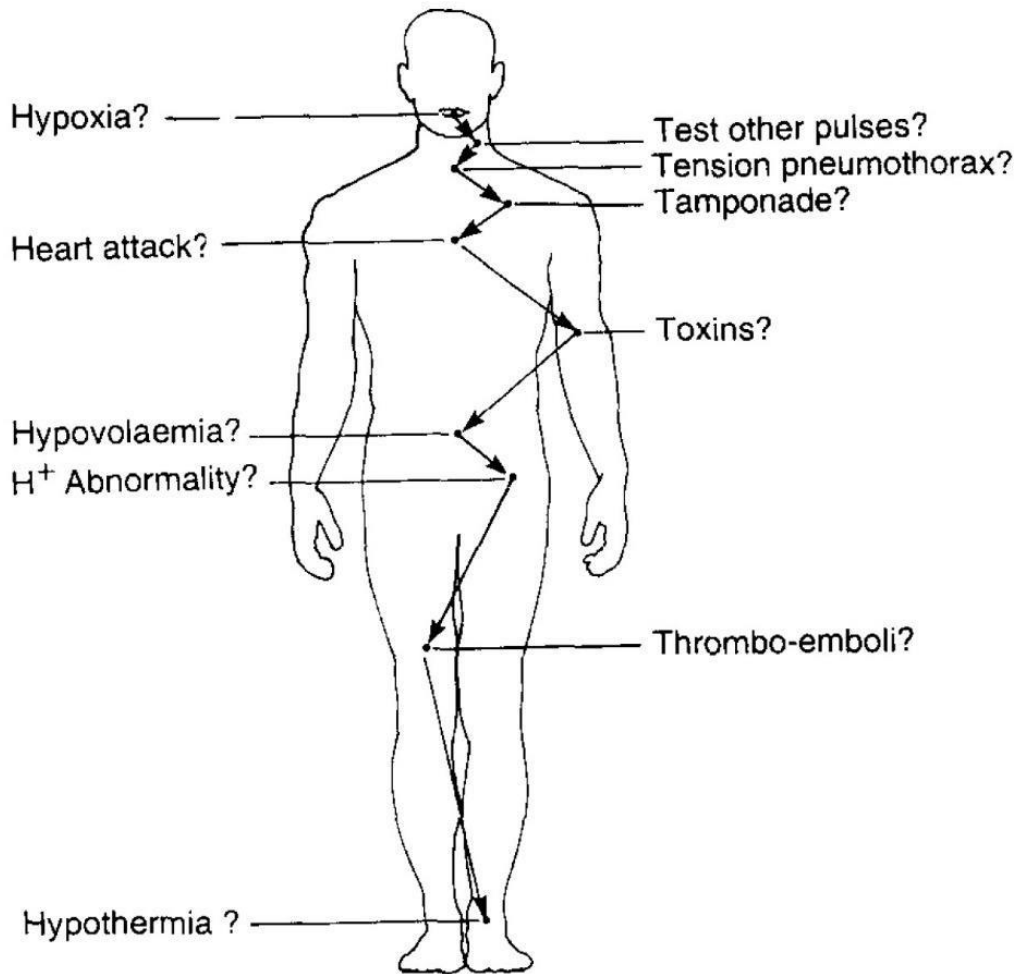


Figure 1 - The original “zigzag” approach from the original paper “A practical approach to the aetiology of pulseless electrical activity. A simple 10-step training mnemonic. Resuscitation. 1995 Oct;30(2):157-9.”