

Poster Abstract ■

Automated Medical Algorithms: Issues for Medical Errors

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Background

The National Patient Safety Foundation has sponsored a report to describe the current research being pursued in the area of medical error reduction and to identify the gaps in this effort.¹ A total of 23 gaps were identified—among them was a need for more research in the area of communication and information sharing. One of the areas that we see a need to explore is the wealth of published information in the form of medical algorithms. Centralizing and automating medical algorithms is one way to share information among a wide range of clinical care providers. Furthermore, automation of medical algorithms assists in the correct selection (reducing errors of planning) and application of that information (reducing errors of execution).

Medical Algorithms

The purpose of a medical algorithm is to improve the delivery of medical care. A previous effort revealed 16 types of algorithms that were encountered during the construction of a centralized repository of such algorithms ranging from simple calculations such as determining Body-Mass Index to complicated formulas predicting clinical outcomes.²

Medical Algorithm Issues

Issues we have identified include: 1) *Not Using an Algorithm* which can be further characterized as causing the following errors or inefficiencies: a) Failure to use an algorithm when it would be appropriate to do so. b) Failure to recognize or characterize different population and situations. c) Failure to risk adjust outcomes. d) Spending unnecessary money, wasting time. 2) The second issue is *Potential Errors Using Algorithms* which are characterized as: a) Inappropriate use of output. b) Using a version out of date or with an error. c) Using an algorithm irrelevant or unresponsive to condition. d) Using an algorithm with inappropriate complexity. e) Using an algorithm based on ambiguous data. f) Failure to properly specify the appropriate population or group. 3) The third area is *Problems with Typical Algorithm Representations* which include: a) Oversimplification of algorithms to enable questionnaire or checklist formats, or cumbersome forms with lots of choice points. b) Calculations are often simplified to reduce calculation time. c) Supporting documentation is often not available. d) Assumptions about patient population are often unspecified.

Error Reduction by Automation

The following are potential benefits of automation: a) Reduce data entry errors. b) Remove calculation errors. c) Facilitate recall of algorithm details. d) Reduce selection of overly simple algorithm. e) Reduce selection of wrong algorithm for population or situation. f) Guide appropriate use of output. g) Prevent use of a version out of date or with an error.

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Validation of Algorithms

This is an extremely important issue which we lack the space to describe.

MEDAL—MEDical ALgorithms Project

The goal of the Medical Algorithms Project is to provide a collection of algorithms in a format that supports clinicians, programmers, and validators.^{2,3} It contains a collection of over 2,650 algorithms represented in a spreadsheet format with references to the original sources. MEDAL uses a standardized representation of the algorithms that was designed to support future automation. See (2) for a more complete discussion.

Conclusion and Future Work

It is clear that medical algorithms are one key format for sharing medically relevant information and that the sharing of such information is needed for safe

patient care. We have described here a number of errors that can be minimized through the use of automated medical algorithms. We have also described ways in which potential introduction of errors by such automation can be minimized, primarily through rich communication of algorithm details and validation. Since the ultimate responsibility for proper use resides with the clinician, there is a great need for such a complete representation of the algorithms, enabling easy retrieval of relevant information.

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