Flow of report;

Background, definition and evolution of CDSS systems.

How studies to assess effectiveness are conducted – methodological considerations in containing reviews (describe how outcomes are selected and factors considered in analysis)

Describe included studies – how many feature in how many reviews, disparity in rating etc

**1.Definition;**

According to Lobach et al (*insert reference here)*  CDSS is any electronic system designed to aid directly in clinical decision making, in which characteristics of individual patients are used to generate patient-specific assessments or recommendations that are then presented to clinicians for consideration examples; alerts, reminders, order sets, drug – dosage calculations, care-summary dashboards that provide performance feedback on quality indicators or benchmarks.

Wyatt and Spiegelhalter *(insert reference)* active knowledge systems which use two or more items of patient data to generate case specific advise

**Features;**

Hunt 1998 ; can synthesize and integrate patient-specific information, perform complex evaluations and present the results to clinicians in a timely fashion. Examples ; CDSSs designed to recommend appropriate drug doses, to provide immunization reminders

2. Evolution

(*insert reference Wright et al 4- phase model)* History of CDSS systems based on architectural development. Architecture means how these systems interact(or choose not to interact ) with other related systems , such as Computerized Physician Order Entry(CPOE) and electronic health record (HER) systems. The following 4 categories elucidated;

* Standalone systems beginning in 1959 – paper by Leldley and Lusted in science on probabilistic model for medical diagnosis with grounds in set-theory and Bayesian inference – tutorial in statistical and probabilistic inference for clinicians. Building on these methods and with increase in computing power various independent systems were developed, they were stand alone and could be developed by anyone with understanding and clinical knowledge. They systems have to be sought out and are not pro-active, and due to system independence data was not integrated with other systems thus forcing the entry of other digital data like lab data manually and consequently forcing users to loose the essence of time
* Integrated systems beginning 1967 – Unlike stand alone systems, they integrate with other systems like HER thus are pro-active, enabling users to make informed decisions on particular patients or cases. Have the advantage of integration but disadvantage of being adopted to the clinical systems they are built in and require technical expertise to update the existing code to reflect any guideline updates
* Standards-based systems beginning 1989 – development of arden syntax to bring together “maintenance”, “library” and “knowledge”
* Service models beginning 2005

Architectural model is sequential and evolutionary – systems learned from prior systems and working influenced by previous phase

Introduction

Information Technology (IT) is now an integral component of our lives – personal and professional. (*insert reference)* IT’s growth has been fostered by the massive permeation of computers, initially to boost efficiency in economic productivity and later in personal use. (*insert reference).* In healthcare, computers were initially widely adopted for use with electronic health records(EHR) and gradually with the automation of various diagnostic systems. (*insert reference)* Their remarkable convenience in EHR was a precursor for permeation into other areas of healthcare systems and potential utility in evidence-based medicine especially in lieu of the gaps between research findings and routine practice. (*insert references)*

Emperic evidence has continually pointed to low translation of research findings into routine care and the resulting detrimental effects on the quality of care offered to patients. (*Insert reference*) *Quote some statistics and authors of the challenges.* These challenges have given birth to implementation science which is *“definition”.* One of the fundamental tenets of implementation science is measures aimed at modifying the behaviours and habits of healthcare professionals towards practices seeking to improve quality of care offered to patients. (*insert reference)* As a result of the massive proliferation of EHR systems and computers in routine medical practice, computerized decision support systems (CDSS) have emerged as plausible platforms to stimulate desirable professional habits. (*insert reference)* CDSSs are “*insert definition here” (followed by references).* Due to their continued adoption, they have attracted research efforts and activities aimed at estimating effectiveness versus other methods of behaviour modification like CMEs, feedback and mentors (*make an exhaustive list then give references).*

However, CDSSs in healthcare are not new, they have been in use since as early as 1967. *(insert reference) Author names* described the history of CDSSs using their architectural features from 1960s in a publication titled *insert title then reference.* This implies that research aiming to assess various dimensions of CDSSs has been incessantly occurring and hence attempts have been made to summarise the effectiveness of these dimensions, including in behaviour modification through systematic reviews and meta-analyses. *(insert reference)* Reviews in CDSSs first began to address quality assessment in *insert year,* followed by impact on providers and patients in *insert year. (insert references)*

Since IT is constantly evolving, CDSSs are also changing necessitating continued assessment of effectiveness especially on provider performance. *(find reference)* The same considerations might be difficult to apply particularly when evaluating provider-related behaviour thus making the process more subjective. *(insert reference)* In spite of this, existing systematic reviews and meta-analyses must be constantly updated to reflect the most current evidence on effectiveness. This is likely to be challenging because there are no clear guidelines on how frequently systematic reviews and meta-analyses updates should be conducted. *(insert reference)* For reviews centred on patient-related interventions, stakeholders and authors agree that the most important factors to consider include; the currency of the question asked, the need for credibility, availability of new evidence and impact of new methods or findings in existing effect estimates. *(insert reference)*

The lack of updating guidelines, changes in technology and scientific methodology make it even more challenging for CDSSs reviews. To address this challenge, it is pertinent to have a cumulative effect estimate of CDSSs to first establish whether there any significant changes in the effectiveness with regards to behaviour modification through the years. Beyond the changes in effectiveness, it is critical to highlight the type of outcomes used in assessing behavioural changes, delineate how they are designated and how analysis is conducted in deducing the reported effectiveness. Some researchers have postulated that CDSSs are not associated with improvements in care despite the massive resource investments. (*insert reference*)

To be able to address these challenges, it is prudent to conduct a cumulative review and meta-analysis of the existing evidence. We would like to gauge the appropriateness of our findings in recommending that additional studies on the effectiveness of CDSSs in behaviour modification may be unwarranted and that existing reviews and meta-analyses may not require further updating. In doing so we hope to reduce on the wastage in research and perhaps identify areas of CDSSs research that may require attention. (*waste in research reference)*

Indeed, researchers have in the past recommended that a cumulative meta-analysis should be conducted prior to undertaking any study as it gives a comprehensive view of the existing evidence as well as a proper starting point on considerations like sample size calculation. *(insert reference)*