Barriers and facilitators to implementing Clinical Imaging Referral Guidelines among medical professionals: Protocol for a systematic mixed studies review

Harriet Nalubega Kisembo (kisemboharriet@yahoo.co.uk)
Mulago National Referral Hospital https://orcid.org/0000-0001-6542-8743
Alison Annet Kinengyere
Makerere University College of Health Sciences
Abdirahaman Omar Sahal
Makerere University College of Health Sciences
Richard Malumba
Ernest Cook Ultrasound Research and Education Institute
Dina Husseiny Salaama
National Center for Radiation Research and Technology, EAAEA, Cairo
Michael Grace Kawooya
Ernest Cook Ultrasound Research and Education Institute

Protocol

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Abstract

Background

The past two decades have seen increasingly rapid advances in the field of diagnostic imaging technology. This has significantly contributed to the quality of medical care outcomes. However, a number of studies have found that 20%-50% of imaging requisitions are inappropriate and unjustified. This wastes the already meager resources and exposes patients to unnecessary radiation with increased risk of radiation induced cancers.

Clinical Imaging Guidelines (CIGs) are evidence-based tools developed to support the imaging referrer's decision-making process by choosing the most appropriate imaging investigation for a particular patient with a specific set of symptoms and signs.

However, implementing CIGs has not been effective in several settings. Identifying factors that influence CIGs implementation could give an insight into the type of strategies to put in place before implementing CIGs

This systematic review protocol is aimed at understanding barriers and facilitators that influence implementation of CIGs among medical professions.

Review Methods

The development of the systematic review protocol will follow Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (PRISMA-P) (additional file 1)

Key databases Pubmed (Medline) and Embase will be searched using relevant terms. The, experts in the field will be contacted for their opinion and references from included studies will also be searched

Only literature written in the English language will be reviewed. All study designs will be included, and there will be no limit set by the year of publication.

The criteria for inclusion will be those studies which document and discuss barriers and facilitators to implementing CIGs among medical professions.

All identified studies will be screened by a single reviewer but Quality of the studies to be included and extraction of data will be independently performed by two reviewers. Any discrepancies will be resolved by consensus through discussion, with a 3rd reviewer as a tie breaker

Pre-established categories of barriers and facilitators to implementing CIGs in practice from literature, will be used to assess content analysis

Discussion

The findings from this review will provide an insight and direction to the “champions” implementing adoption or adaption of CIGs, especially in Africa of what is ahead of them for proper planning

The protocol has been registered at the International Prospective Register of Systematic Reviews (PROSPERO; registration number: CRD42020136372.

Introduction And Rationale

The past two decades have seen increasingly rapid advances in the field of diagnostic imaging technology such as Multi-Detector Computed Tomography (MDCT). This has undoubtedly improved the quality of health care outcomes for several diseases and trauma (1). However, a number of studies have found that 20%-50% of imaging requisitions are inappropriate and unjustified (2-8). This wastes resources and exposes patients to unnecessary radiation with increased risk of radiation induced cancers. It is estimated that 2% of all future cancers cases may come from previous computed tomography (CT) exposures (5, 9-14).

The International Commission on Radiation Protection (ICRP) and the new International Radiation Basic Safety Standards (BSS) have highlighted justification of medical exposures as one of the key principles of radiation protection in medicine (15-21) .

Justification as used in radiation protection means that the medical exposure to the patient must provide a net benefit, in other words “doing the right thing”. Appropriateness goes beyond justification by promoting the use of the “best test first”, for a given setting.

With the rapid evolution of medical imaging technology, imaging prescribers and providers may not have up to date information concerning the most appropriate imaging modality and related radiation risks (2, 8, 18, 22-28).

CIGs have been produced to help physicians decide when an imaging study would be useful and identify the best, safest and most appropriate examination for a particular patient with a specific set of symptoms and signs (29-32) .

A number of studies have found that the use CIGs can reduce inappropriate CT requisitions by 20-30% with the potential for a 44% reduction in some areas (33-38). Such a clinical tool facilitates good clinical practice by ensuring that the benefits from the diagnostic procedure outweigh the risks, and that there is value for the costs incurred (39).

However Given the high costs of writing, developing and continuously updating CIGs; only a few professional organizations in a few countries have developed comprehensive, independent, evidence-based clinical imaging guideline sets, presented as referral guidelines or appropriateness criteria (40, 41). Some examples of CIGs include Criteria of the American College of Radiology (ACR) (42), Making the best use of Clinical Radiology’ (RCR, 2013) UK (43), the European Society of Radiology (ESR ‘iGuide)(44),

the Canadian Association of radiologist guidelines, 2012 (CAR) the Western Australian Diagnostic Imaging Pathways (45) and the Korean Society of Radiology (KSR) (39) guidelines .

Several audits have shown that CIGs are not effectively used even in settings where they are available due to several factors (46-52). Though the use of CIGs is not mandatory, a medical practitioner should have a justifiable reason to depart from them because they have been proved to support good medical practice, patient care, radiation protection and procedure justification. Unjustifiable departure from CIGs may have cost implications, expose the patient to unnecessary radiation thus upturning the benefit to risk ratio.

Grol and Wensing's model recommends identifying the factors that may influence guideline implementation before commencing the process of guideline implementation (53). When such factors are identified, strategies tailored to mitigate negative factors (barriers) and enhance positive factors (facilitators) (54, 55) can then be developed

This systematic review will therefore explore the evidence that exists concerning barriers and facilitators to CIGs implementation, and determine those that can be applicable to low resource settings. The findings shall provide baseline - information to inform policy, support guideline developments and customize decisions

Rationale for this systematic review

This review and meta-analysis will be among the first to systematically explore and integrate the evidence available on the barriers and facilitators of CIGs.

Most reviews are generalized and refer to clinical practice or disease specific guidelines yet imaging is a sub-specialty with its unique barriers, which may need a different approach. Clinical practice guidelines are distinct from CIGs, as they tend to focus on the entire spectrum of a disease, from initial consideration and diagnosis through treatment and outcomes while CIGs tend to be more focused. The other distinction is that some of the international standards for guideline development may not be appropriate for CIGs. For example, whereas accuracy is the key factor before choosing an appropriate diagnostic test (56) , this may not be the case for diagnostic imaging. The hypothesis is that the barriers and facilitators influencing CIGs are likely to differ from the ones affecting general clinical practice or disease specific guidelines. The other consideration for this review is that almost all previous reviews focused on factors influencing guideline implementation in high resource settings and yet the challenges and strategies from the low resource setting are likely to be different

Review objectives

To identify, assess and synthesize the evidence on barriers and facilitators that influence implementation of clinical imaging referral guidelines among medical professionals.

Review questions

What barriers and facilitators influence implementing diagnostic imaging referral guidelines among medical professionals?

Review Methods

Definitions used for this review

1. Barriers are defined as any factor that obstructs or limits or restricts the capacity for medical professionals to implement CIGs in their routine clinical practice.
2. Facilitators are defined as factors that enable the implementation of CIGs'.
3. Clinical Imaging Guidelines or clinical imaging referral guidelines, or clinical diagnostic imaging guidelines are systematically developed evidence-based statements to assist referrers, radiological imaging practitioners and patients to make decisions about the appropriate care for specific conditions (57).
4. Medical profession

These are defined as any medical professionals of any type based in health care settings (e.g., hospitals, ambulatory clinics, community-based physician offices) who prescribe or refer patients for imaging procedures including specialists, general medical practitioners, doctors in training, and allied health professionals who are entitled to request radiological examinations.

An expert will be a person who knows a lot about imaging guidelines based on the expert's publication in that area, work experience or as recommended by the relevant professional bodies.

Study design

This will be a mixed studies review including both qualitative and quantitative studies. Randomized and non-randomized controlled trials, quasi-experimental/ before and after studies, prospective and retrospective cohort studies, descriptive study designs including case series, case reports, descriptive cross sectional studies, focus groups interviews and program evaluations that describe methods to implement guidelines or promote compliance

Systematic reviews will not eligible but will be used to identify additional eligible primary studies.

This protocol has been written according to the PRISMA-P (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to enhance methodological transparency and improve the reproducibility of the results and evidence synthesis (58)

The PRISMA-P checklist is given in the Additional file 1.

Eligibility criteria

Studies will be selected according to the following inclusion

- Primary Research
- All studies that provide data for either of these two outcomes (barriers and or felicitators to CIG implementation).
- All study designs /All evidence levels from RCT to expert opinion
- Only studies in English
- There will be no limit imposed by year of publication
- When more than one publication described a single study and each presents the same data, we shall include only the most recent publication.

  However, when more than one publication describes a single study but each presents new and complementary data, all shall be included

Participants/population

Populations referred to are various medical professionals of any type based in health care settings (e.g, hospitals, ambulatory clinics, community-based physician offices) who prescribe or refer patients for imaging procedures (specialists, general medical practitioners, doctors in training, allied health professionals who are entitled to request radiological examinations). The review will consider any age and any gender

Intervention

Diagnostic Imaging Referral Guidelines (also called Imaging referral guidelines, clinical imaging guidelines, decision support tools), hear referred to as Clinical Imaging guidelines (CIGs) are evidenced based tools to support referrers, radiological imaging practitioners and patients to make decisions in the selection of appropriate diagnostic imaging procedures for a specific condition. Imaging referral guidelines provide physicians with information regarding which procedure is most likely to yield the most informative results, and whether another modality is equally or more effective. Guidelines for clinical imaging are also referred to as “appropriateness criteria,” “referral guidelines,” and “justification criteria” (29-32). Their use improves appropriateness and justification of radiological procedures thereby reducing unnecessary radiation exposures and efficient as well as effective utilization of resources, with ultimate enhancement of quality of care. Only imaging referral guidelines that are endorsed by a national governmental or professional association, provider organization related to imaging will be included in this review. The definition of CIG for purposes of this review will encompass all formats of imaging referral guidelines (e.g. tabulated vs flow charts) and media (e.g. hard copy, electronic copy, interactive web-based, smart phone-based, clinical decision support systems etc.) will be included.

Comparator (s)/control

None

Outcome

Outcomes reported in the eligible studies and are relevant to the study type: perceived or experienced barriers or facilitators to CIGs implementation will be considered as primary outcomes.

Additional outcomes of the review will include any recommended interventions or strategies to promote guideline use.

Setting

The intervention should be CIGs used in hospitals, healthcare organizations, health care ministries, primary health care, outpatient clinics, or general practitioner's offices).

Exclusion criteria

- Studies that were based on infection control, quality improvement, patient safety, client-centeredness, or organizational “best practices” but did not explicitly name and reference an imaging guideline
- Commentaries, articles with missing abstracts, but letters to the editor, considered as “exert opinion”, shall be include.
- Studies with disease-specific information on barriers and/or strategies, which do not allow for generalizations
- Guidelines focused on cancer screening which is are not generalizable and have nothing to do with CIG of any type.

The Search Strategy

Information sources

Electronic searches

Electronic databases will be searched to identify all the relevant studies. We shall search the following electronic databases:

- PUPMED/MEDLINE
- EMBASE
- Web of Science

Other methods to be used for identifying relevant research

1. Google Scholar - this will identify information that may be missed out in the journal databases.
2. The grey literature – this consist of unpublished reports, dissertations and theses, non-referenced publications
3. Reference list of all included and excluded studies

Search engines and websites of conferences proceedings, or meeting. proceedings and papers, ongoing research and expertise: Contacting experts in this field e.g. from professional bodies like American College of Radiologists, Royal College of Radiology, European Society of Radiology, World Health Organization, International Atomic Energy Agency.

Search Strategy

The search algorithm will be developed with advice of an experienced librarian. This will focus on the keywords and their synonyms.

The search terms will be based on the title and research questions and these will be categorized under Population, intervention, comparisons, (PICO) outcomes) framework as in Table 1

Table 1: Terms to be used in literature search

Population	Medical professionals Healthcare providers OR healthcare workers OR physicians OR clinicians OR general practitioners
Intervention and synonyms,	Clinical imaging guidelines Clinical imaging referral guidelines , diagnostic imaging referral guidelines, decision support tools, Appropriateness criteria, ” Decision support tools, Computerized decision support tools, diagnostic imaging pathways, making the best use of a radiology department, “iReffer’. iGUIDE,
Comparator	None
Outcome	Barriers, compliance, adherence, usage, facilitators, strategies, opportunities

The search terms will include the following:

1. Clinical imaging - Clinical imag* OR diagnostic imag* OR referral* AND (guidelines OR decision support tools) OR radiology OR radiography OR Medical imag* OR “unnecessary imaging” OR “unwarranted imaging” OR overutilization OR overus* Clinical imaging referral guidelines , diagnostic imaging referral guidelines, decision support tools, Appropriateness criteria, ” Decision support tools, Computerized decision support tools, diagnostic imaging pathways, making the best use of a radiology department, “iReffer’. iGUIDE,
2. Medical professionals - Healthcare providers OR healthcare workers OR physicians OR clinicians OR general practitioners, referrers, referring clinician, prescribers,
3. Barriers OR compliance OR adherence OR usage OR facilitators OR strategies OR opportunities

Data management

An experienced librarian will perform an initial search of PubMed (Medline) and EMBASE using keywords and Medical Subject Headings (MeSH) guided by the search strategy list above. Inclusion/exclusion of studies retrieved from the search will be based on the title and abstracts only during the first stage of screening. A second search using all identified keywords and index terms will then be undertaken across all included databases, thirdly, the reference list of all identified reports and articles will be searched for additional studies. All titles and abstracts generated by the searches will be downloaded into EndNote reference manager for screening. Duplicates will be removed. A Microsoft Excel spreadsheet will be used to record the decision making of the screening process. Citations deemed relevant will be selected and the papers retrieved for full-text eligibility screening. Any studies where decision cannot be made whether to include or exclude in the first stage, further reading of the full text will be done before a final decision is made. Studies identified through reference list screening will undergo the same approach.

Selection, appraising and extraction of data from the research papers

Screening process

Initially, two reviewers (KHN and AOS) will independently scrutinize titles and abstracts in English for eligibility. Citations deemed relevant by either reviewer will be selected and the papers retrieved for full-text review. Next, each eligible article will be independently assessed by the two reviewers against the selection criteria. In addition, the references of the relevant articles will be reviewed. Disagreements will be resolved by discussion between the reviewers and consensus. A third reviewer (MGK) will be the tiebreaker if still fails to agree. A list of excluded studies with their reasons for exclusion will be maintained. A standardized template generated from the inclusion and exclusion criteria based on PICO (population, intervention, comparisons, outcomes) framework) will be used to screen for

eligibility of a study. All members of the research team will review eligibility criteria and provide feedback, which will be used to refine the eligibility criteria. The research team will comprise of radiologists, evidence-based scientists, and systematic review methodologists. The template will have a list of questions that help to identify those studies that meet the inclusion criteria. If all questions are answered in affirmative, that study will be included, but if the questions are answered in the negative way, such studies will be excluded.

Risk of bias (quality) assessment

Quality assessment of included studies will be based on an existing framework and its set of validated tools (59-61).This framework is selected because its authors provide reviewers with a manual for definitions and detailed instructions, which eases quality scoring of quantitative, qualitative and mixed methods studies. These tools allow for an overall assessment of key biases of the included studies, and the final quality ratings will be then be utilized to assess the reliability of the identified factors.

Two reviewers (KHN and AOS) will independently assess the quality of each study. Discrepancies between the two reviewers will be resolved by consensus through discussion with a third reviewer (KGM) as the tiebreaker.

A list of excluded studies with their reasons for exclusion will be maintained.

Data extraction

A data extraction sheet based on a taxonomy of barriers and facilitators to implementing clinical practice guidelines in actual practice (62, 63) will be used. This particular taxonomy was previously used in two previous studies and found it compared well to other taxonomies. One study assessed health professional's perceptions in regard to barriers and facilitators to implementing shared decision-making in clinical practice (64) and the

second one studied the factors affecting general practitioners' decisions about plain radiography for back pain by Espeland and colleagues (63)

Two reviewers will independently extract all relevant data using a pre-developed standardized form. Differences will be resolved by consensus through discussion with a third reviewer (KGM) as an arbitrator if no agreed conclusion is reached.

The following categories of data will be extracted (1) identification of the study (article title; journal title; impact factor of the journal; authors; country of the study; language; publication year; host institution of the study (hospital; university; research Centre; single institution; multicentre study); (2) methodological characteristics (study design; study objective or research question or hypothesis; sample characteristics, eg, sample size, sex; age, race; groups and controls; types of CIGs implemented (description of the guideline, intended users , development team),implementation strategy, inter-rater reliability ; statistical data analyses, adjustments (3) main findings (barriers and facilitators in implementing CIGs), use of a conceptual framework (e.g. the physician’s area of practice such as family medicine, emergency medicine, etc.) including themes and subthemes, rating scheme for the strength of the evidence and recommendation, method of validation and (4) conclusions
For qualitative studies, interview and focus-group quotes will be double-extracted in separate documents. Two reviewers will meet and review all identified factors, discuss until consensus is reached. A list of excluded studies with their reasons for exclusion will be maintained.

Data synthesis

All results will be subjected to a double data entry. If two or more of the included quantitative studies are sufficiently homogeneous and are of adequate quality, a meta-analysis will be performed and effect sizes calculated using appropriate software.

Odds ratios for categorical data and weighted mean differences for continuous data and their 95% confidence intervals will be calculated for effected sizes using analysis. / For dichotomous data, the effect sizes will be expressed in terms of relative risks and 95% CI. Heterogeneity will be assessed statistically using the Chi-square statistics and if appropriate, explored using subgroup analyses based on different quantitative study design included in the reviews.

For the outcomes where statistical pooling is not possible a descriptive synthesis of the quantitative the findings will be presented in narrative form such as summary tables and figures.

For qualitative studies two reviewers will independently read each publication and identified the unit of text (a sentence or paragraph representing one idea) relevant to each of the main outcomes of interest (barriers or facilitators to the implementation of CIGs in clinical practice). Each unit of text will then be coded according to the relevant and pre-established code list and entered into an Excel spreadsheet using a framework synthesis approach, NVivo 11 software will be used for data management.

Units of text which could not be coded will be discussed by the two assessors and new codes will be created as necessary. Discrepancies between the coders will be resolved through discussions and concession. Themes will be ordered according to the number of studies in which they are identified. Where textual pooling is not possible the findings will be presented in narrative form. To analyze the included studies, a thematic analysis will be conducted, in line with best practice when aggregating data from different types of research (65, 66).

Specifically, all identified factors will be organized into barriers and facilitators and counted by frequency. The identified factors will then be categorized following thematic analysis (67). Identified factors will only be counted once per study, except when a study

identifies factors specific to different subgroups (e.g. according to different organizational cases or by different types of evidence-based practice.

The synthesis of quantitative results will be integrated with the analysis of qualitative papers, using thematic analysis. The guidelines "Consolidated criteria for reporting qualitative research" (COREQ) will be followed in order to guarantee a comprehensive report of qualitative studies

Analysis of subgroups or subsets

A subgroup analysis considering gender, and resource setting, qualification of medical professionals and setting) developed or developing countries may be performed if the data extracted from the included studies is sufficient

Discussion

The significant burden associated with unjustified imaging, resulting in unnecessary radiation exposures and risk of radiation induced cancers is a radiation safety concern. This emphasizes the need to adopt or adapt CIGs into routine clinical practice to support imaging referrers make decisions that are appropriate and justified. Identification of all possible barriers and strategies that may influence their implementation is a good planning strategy for CIGs implementers

Given the knowledge gap that exists concerning factors that influence CIGs implementation, this planned review and meta-analysis will systematically explore the evidence available on the barriers and facilitators to the implementation of CIGs. This acquired knowledge will provide baseline information and a direction for future research.

This knowledge can also be used by CIGs implementers to develop cost-effective and appropriate strategies and interventions that promote CIGs implementation during the planning stage.

These strategies can be extrapolated and tailored to low resource settings that are in the process of adopting and adapting CIGs.

List Of Abbreviations

ACR: American College of Radiology

ICRP: International Commission of Radio

MDCT: Multi-Detector Computed Tomography

CIGs: Clinical Imaging Guidelines

CT: Computed Tomography

JBI: Joanna Briggs Institute

PRISMA-P: Preferred reporting items for systematic review and meta-analysis protocols

RCR: Royal College of Radiology

R.C.o.R: Royal College of Radiology

RCT: Randomized Clinical Trial

Declarations

Ethics approval and consent to participate

The study is exempted from ethical approval since this systematic review and meta-analysis will handle only secondary analysis of data already existing in scientific databases.

Dissemination plans.

Findings will be submitted for publication in peer-review journals and relevant professional conferences

Consent for publication

Not applicable.

Availability of data and materials

The studies included in the review will be available upon request.

Competing Interests

There are no conflicts of interest by any of the authors

Funding

The study is a part of a PHD project entitled “Effect of clinical imaging guidelines on appropriateness of Computerized Tomography requisitions for young patients in six selected Hospitals in six selected hospitals in Uganda” Self -funded and no external funding

Authors’ contributions

KHN will serve as the first author of the protocol and review paper. She conceived the idea of a systematic review, led all the stages of the protocol development, including development of the research question

and objectives, search strategy, extraction and analysis plan. KHN and MR are responsible for the writing of the protocol. All authors critically revised it for important intellectual content. AAK performed the search strategy and did the literature search. All authors read and approved the final version of this article.

Kisembo Harriet Nalubega (KHN) is the guarantor of this work.

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Author information

Author's affiliation

Makerere University, College of Health Science

School of medicine, Mulago National Referral and Teaching Hospital

Department of Radiology P.O.BOX 7062

- Kisembo Harriet Nalubega
- Abdirahaman Omar Sahal

Sir Albert Cook Library

And the Africa Center for Systematic Reviews and Knowledge Translation

Makerere University - College of Health Sciences

- Alison Annet Kinengyere

Mulago National Referral Hospital

Kampala Uganda

- Kisembo Harriet Nalubega
- Irene Dorothy Nalweyiso

Ernest cook Ultrasound Research and Education Institute (ECUREI)
Mengo Hospital. Albert Cook Building, Albert Cook Road
P.O.BOX 7161. Kampala, Uganda

- Richard Malumba
- Michael G Kawooya.

National Center for Radiation Research and Technology, EAAEA, Cairo, Egypt

Email: drdinahusseiny@yahoo.com

- Dr Dina Husseiny Salama

African Centre for Systematic Reviews and Knowledge translation

Makerere University College of Health Sciences

2nd Floor, Clinical Research Building,

Authors' information

KHN is a PHD fellow at Makerere University, College of Health Sciences, School of Medicine, Department of Radiology, Kampala Uganda

MGK is a professor of Radiology and Director at Earnest Cook Ultrasound Research and Education Institute, Kampala Uganda

MR is researcher and epidemiologist Earnest Cook Ultrasound Research and Education Institute, Kampala Uganda.

KAA is Academic Librarian and Information Science Specialist at Sir Albert Cook Library and the Africa Center for Systematic Reviews and Knowledge Translation, Makerere University - College of Health Sciences, Kampala - Uganda

AOS is a finalist resident at Department of Radiology, College of Health Sciences, Makerere University

DHS is a professor of radiology at the National Center for Radiation Research and Technology, EAAEA, Cairo, Egypt

Corresponding author

Correspondence to Kisembo Harriet Nalubega

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