

Patient Safety Efforts in Tanzania: A Rapid Review of Two-Decades Efforts (2002-2022) to Inform Interventions towards Attainment of 2030 Targets

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Abstract

Introduction: The need to address the problem of patient safety has been a focus of World Health Assembly (WHA) meetings of 2002, 2019 and 2021. The 2019 WHA Resolution urged the Member States to take action on patient safety. We aimed to review patient safety efforts in Tanzania from 2002 to 2022 to inform improvement efforts towards the 2030 target. **Methods:** A rapid literature review was conducted between January 2002 and April 2022. We searched Google, PubMed and PubMed Central in April and May 2022 using the following search terms: PubMed—“patient safety Tanzania”, “blood safety in Tanzania”, “safe surgery Tanzania”, and “healthcare-associated infections Tanzania”; Google—“blood safety in Tanzania”, injection safety in Tanzania”, “infection prevention and control”, “radiation safety in health facilities in Tanzania”; and PubMed Central—“injection safety in Tanzania. **Results:** The search identified 4160 articles, of which 4053 were removed in initial screening; 21 were duplicates, giving 86 relevant articles for full screening. Of the 86 articles, 04 were removed after the full screening, hence

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remaining with 82 articles. Among the 82 eligible articles, 27 are on IPC, 26 on safe surgery, 12 on blood safety, 07 on radiation safety, 06 on injection safety, and 02 on medication safety. One article was relevant to—blood safety, IPC and injection safety; and one article was relevant to—IPC and injection safety. **Conclusion:** Most of the eligible literature was on IPC and safe surgery, followed by blood safety, radiation safety, injection safety and medication safety. The literature on IPC has highlighted the need to strengthen efforts to address AMR. Findings from the implementation of the safe surgery 2020 intervention warrants for its scale-up to other zones. There is a need to strengthen hemovigilance and pharmacovigilance functions; and strengthen quality management and assurance systems and regulatory functions to ensure radiation safety.

Keywords

Patient Safety, Safe Surgery, Infection Prevention and Control, Medication Safety, Radiation Safety

1. Introduction

In 2002, during the World Health Organization (WHO) Fifty-fifth World Health Assembly (55 WHA), the WHA passed Resolution WHA 55.18 (of 18 May 2002), which urged the Member States to “*pay the closest possible attention to the problem of patient safety; and to establish and strengthen science-based systems, necessary for improving patients’ safety and the quality of health care, including the monitoring of drugs, medical equipment and technology*” [1]. Following the resolution on patient safety, the WHO continued with the efforts to provide guidance to the Member States in which one of the key actions was the launching of the World Alliance for Patient Safety in October 2004, charged with a core work of driving forward the agenda on patient safety [2]. The work of the Alliance focused on the following areas: “*Patients for Patient Safety; Reporting and Learning; Taxonomy; Solutions; Research; and Global Patient Safety Challenge*” [3].

The World Alliance for Patient Safety during its lifetime (2004-2014), it had several achievements in the implementation of its roles. [4] In the area of global patient safety challenge, the Alliance launched the first challenge in 2005-2006 under the banner “*Clean Care is Safer Care*”, aiming at taking actions to reduce healthcare-associated infections worldwide [5] [6] [7]. The second patient safety challenge was “*safe surgery saves lives*” [8] [9]. In the area of “*Taxonomy*,” the World Alliance for Patient Safety formed a group to work on “*International Classification for Patient Safety*.” [2]. In the areas of “*Reporting and Learning; and Research*”, efforts to assess the literature on measures for patient safety used in “*developing and emerging countries*” have been done. [10] Also, the Global Alliance in 2010 developed a “*patient safety curriculum guide for medical schools*”

[11]; and in 2011, the Global Alliance developed a “*patient safety curriculum guide for multi-professional*” [12].

In the years after the life of the World Alliance for Patient Safety (2015-2021), the WHO has moved further to engage with a bigger number of stakeholders and partners in order to be able to improve patient safety globally [4]. One of the early efforts was the launch of the Third Global Patient Safety Challenge, called “*Medication Without Harm*,” which aimed at addressing medication safety [13] [14]. Also, in the Seventy-second World Health Assembly (72 WHA) in 2019, a resolution on patient safety (Resolution 72.6 of 28 May 2019 on Global action on patient safety) was passed [15].

Also, the “*Resolution 72.6 of May 2019—Global Action on Patient Safety*” identified clinical programmes and risk areas where the Member States need to focus their patient safety strategies which include: “*medication safety, surgical safety, infection control, sepsis management, diagnostic safety, environmental hygiene and infrastructure, injection safety, blood safety and radiation safety.*” [15]. The area of infection prevention and control (IPC) in Low- and Middle- Income Countries (LMICs) received attention after the establishment of the United States President’s Emergency Plan for AIDS Relief (PEPFAR) in 2003 in which 14 countries namely: Botswana, Ethiopia, Guyana, Haiti, Ivory Coast, Kenya, Mozambique, Namibia, Nigeria, Rwanda, South Africa, Tanzania, Uganda, and Zambia, were supported [16]. Through the PEPFAR support, Tanzania established a National IPC—Injection Safety (IPC-IS) Program in 2004, in which injection safety was given a special attention due to the risks associated with unsafe injections, especially the spread of bloodborne pathogens [17]. In the 1990s, there were widespread practices for the reuse of injection equipment in health care settings worldwide, in 2000 analysis had shown that the reuse of injection equipment contributed to 32%, 40% and 5% of new Hepatitis B virus (HBV), Hepatitis C virus (HCV) and Human Immunodeficiency Virus (HIV) infections respectively [18]. Implementation of Policy interventions on the appropriate use of injection equipment was shown to be cost-effective in addressing the situation [18].

The area of blood safety had received attention since the mid-1970s when the WHO in the Twenty-Eighth WHA in 1975 passed “*Resolution WHA 28.72: Utilization and Supply of Human Blood and Blood Products.*” [19]. In sub-Saharan Africa (sSA) HIV, which causes the Acquired Immune Deficiency Syndrome (AIDS), was widely reported in the mid-1980s and hence, it affected the safety of blood. A study by Fleming in 1997 reported on contribution of blood transfusion on HIV transmission to be between 10% and 15% [20]. However, more recent modeled estimates have suggested it to be lower, at the estimation of less than 1% [21]. A recent systematic review has raised a need for preventing bacterial contamination of blood products and prevention of “*transfusion-associated sepsis*” [22]. Despite improvements that have been made by many countries in sSA, there is still a need for more efforts to address challenges in screening for transfusion-transmitted infections (TTIs) [23].

In the Seventy-fourth meeting that was held virtually due to the ongoing global pandemic of Coronavirus disease 2019 (COVID-19), the Seventy-fourth WHA (74 WHA) on its plenary meeting held on 31st May, 2021 made a key decision on patient safety (Decision WHA 74 (13)) which included: “1) *adoption of the Global Patient Safety Action Plan 2021-2030*; and 2) *a request to the Director-General to report back on progress in the implementation of the Global Patient Safety Action Plan 2021-2030 to the Seventy-sixth World Health Assembly in 2023 and thereafter every two years until 2031.*” [24]. Following the decision to adopt the global action plan on patient safety, the WHO, in August 2021 launched the “*Global Patient Safety Action Plan 2021-2030*,” which contains a 7-by-5 framework (*i.e.*, with seven strategic objectives, each with five specific strategies to achieve it) [4].

Given that adverse events are major health concerns, quantifying the magnitude and characteristics of those events in health provision is necessary to pinpoint research priorities and realistic interventions for patient safety. Therefore, we aimed to conduct a rapid review of adverse events that hamper patient safety. The findings of this study will provide evidence to support the development of priority actions in future research and policies.

2. Methods

We conducted a rapid review (of scientific literature and grey literature) guided by the practical guide for rapid reviews to strengthen health policy and systems [25] of intervention efforts implemented between January 2002 and April 2022. The aim was to understand what interventions related to patient safety have been explored in the literature and their key findings in order to inform the Ministry’s efforts to further improve patient safety towards the attainment of the 2030 global target as envisioned in the Global Patient Safety Action Plan for 2021-2030 [4]. We searched Google, PubMed and PubMed Central using the following search terms: PubMed—“patient safety Tanzania”, “blood safety in Tanzania”, “safe surgery Tanzania”, and “healthcare-associated infections Tanzania”; Google—“blood safety in Tanzania”, injection safety in Tanzania”, “infection prevention and control”, “radiation safety in health facilities in Tanzania”; and PubMed Central—“injection safety in Tanzania.”

The search in Google, PubMed and PubMed Central was done in April and May 2022 as follows: Google (05 & 07 April, 14-16 April, 24-25 April); PubMed (14-16 April; 22 April; 01 May; 07-08 May); and PubMed Central (16-17 April). We limited ourselves to articles and grey literatures published in English between January 2002 and April 2022. We chose 2002 because it is the year when the first resolution on patient safety was passed by the WHA. Articles were included if they focused on any aspect of the patient safety risk programmes and areas, *i.e.*, all aspects of IPC including antimicrobial resistance (AMR); injection safety; blood safety; medication safety; radiation safety; and safe surgery as highlighted in the Resolution 72.6 of May 2019 [15]. Initial screening of the articles

was done independently by one author (ESE) and drafted the results. Then, five other authors (JCH, RPB, RRN, YSM, and CJG) screened the draft results for inclusion, and where there were disagreements or omission, it was discussed among the authors (ESE, JCH, RPB, RRN, YSM, and CJG) and agreement reached after resolving the differences.

3. Results

The search identified a total of 4160 articles (published and grey literature), out of which 4053 articles were removed after screening titles and abstracts/content summary, hence the remaining with 107 articles that were relevant for full screening. Out of the 107 articles, 21 were duplicates, and 04 articles were removed after the full screening of the papers; hence remaining with 82 eligible articles were included in the final analysis as shown in **Figure 1**. Analysis of the 82 articles (77 published literature and 05 grey literatures) on patient safety interventions in Tanzania between January 2002 and April 2022 is shown in **Table 1**.

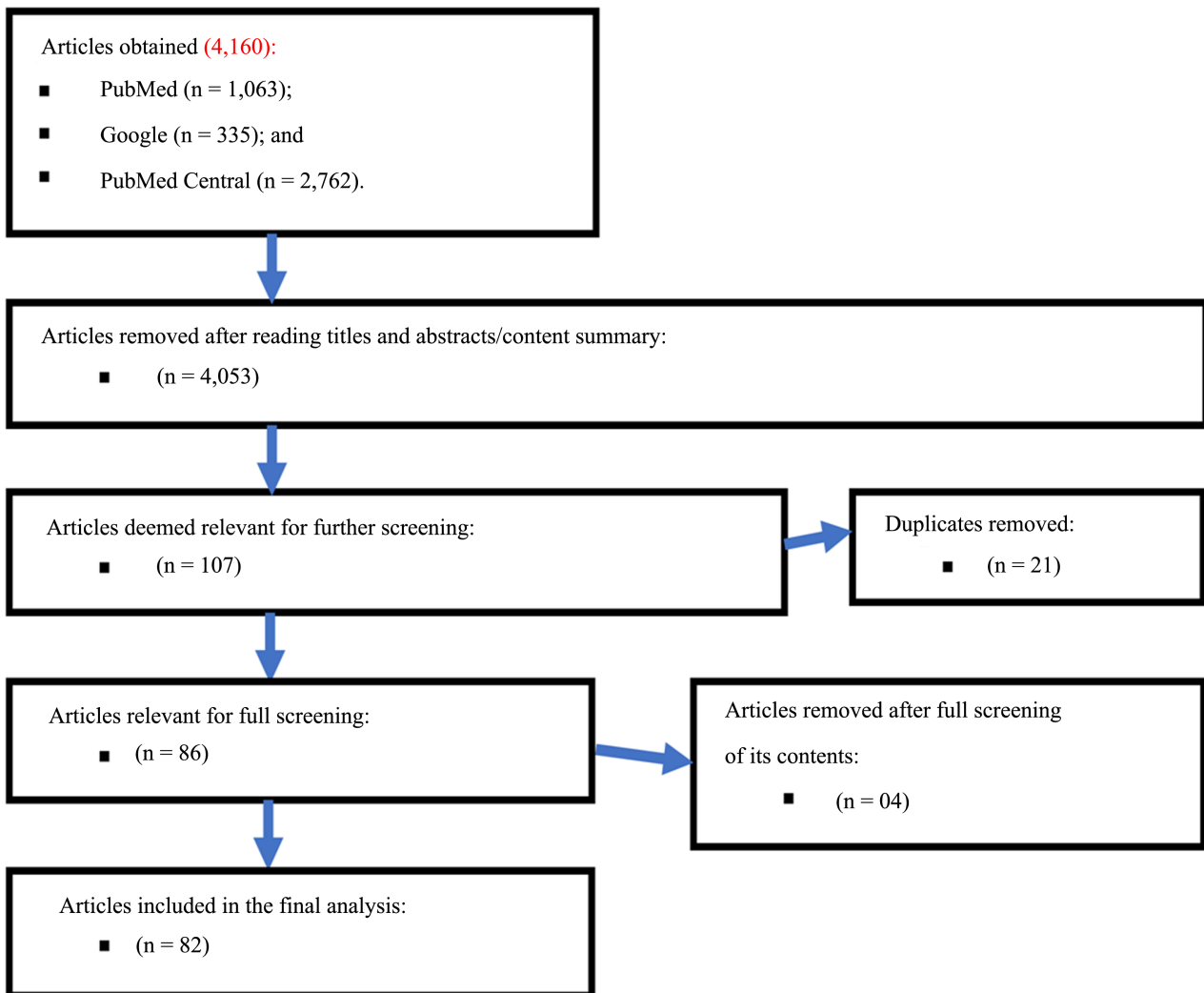


Figure 1. Literature search and analysis process.

Table 1. Summary of patient safety articles in Tanzania from January, 2002 to April, 2022.

First Author [Ref. No.]	Year of Publication	Patient Safety Area	Summary of key findings/issues
Matee, M. I., [26]	2006	Blood Safety	Analysis of a sample of 1599 consecutive donors, out of whom 1424 (89.1%) were males and 175 (10.9%) were females, who donated blood between April 2004 and May, 2005 at Muhimbili National Hospital. Most of them 1125 (70.4%) were replacement donors and a few 474 (29.6%) were voluntary donors. Results showed that the seroprevalence of blood-borne infections was high at 15.9%.
Pitman, J., [27]	2008	Blood Safety	<ul style="list-style-type: none"> ▪ The number of whole blood units collected had increased from 12,597 (2005) to 109,471 (2007); ▪ The percentage of collections from voluntary, non-remunerated donors had increased from 66.5% (2005) to 89.2% (2007); and ▪ The percentage of collected blood units reactive for HIV had decreased from 4.8% (2005) to 2.8% (2007).
Holmberg, J., [28]	2011	Blood Safety	<ul style="list-style-type: none"> ▪ The number of whole blood units collected had decreased from 104,046 (2008) to 95,430 (2010); ▪ The percentage of collections from voluntary nonremunerated donors had increased from 88.3 (2008) to 94.9% (2010); and ▪ The proportion of collected units reactive to HIV had decreased from 3.3% (2008) to 1.2% (2010).
Chevalier, M.S., [29]	2016	Blood Safety	<ul style="list-style-type: none"> ▪ Number of whole blood units collected 2011-2014 increased from 98,176 (in 2011) to 171,661 (in 2014); ▪ Percentage of blood donations collected from voluntary, nonremunerated donors remained at 85% from 2011 to 2014; and ▪ Percentage of collected whole blood units reactive for HIV was 0.8% (in 2011) and 1.3% (2014).
TMDA [30]	2018	Blood Safety	Contains the “ <i>Tanzania Food, Drugs and Cosmetics (Control of Blood and Blood Products) Regulations, 2018</i> ”; which provides for the implementation of haemovigilance function by Tanzania Medicines and Medical Devices Authority (TMDA).
Mohamed, Z., [31]	2019	Blood Safety	Reported analysis of TTIs screening and notification practice at a large urban blood transfusion centre in Dar-es-Salaam, between October 2016 and March 2017, involving 6402 consecutive donors (majority [88.0%] were family/replacement blood donors). Overall TTIs prevalence was 8.4% with HBV being the most prevalent infection (4.1%). TTIs were more common in family/replacement blood donors (9.0%) as compared to voluntary nonremunerated blood donor (4.1%).
Samukange, W.T., [32]	2021	Blood safety	Assessed haemovigilance function of national regulatory authorities in 10 African countries, including Tanzania, in which the findings revealed that the “ <i>implementation and performance of hemovigilance systems in the selected SSA-countries is sub-optimal, which may impact donor safety, blood product quality and safety, and transfusion safety. Also, the implementation of legislative provisions for the establishment of hemovigilance is at a nascent stage.</i> ”

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Makani, J., [33]	2021	Blood safety	<p>Identified opportunities for improved blood transfusion safety as follows:</p> <ul style="list-style-type: none"> ▪ “Educating potential donors, through public awareness campaigns, to move away from replacement or directed donors to safer, voluntary, non-remunerated donors”; ▪ Establishing blood conservation policies, “such as patient blood management by: managing antenatal anaemia and correcting pre-surgical anaemias before childbirth and elective surgery”; and ▪ Implementation of hemovigilance systems which can “contribute to prevention of TTIs and transfusion complications”.
Mremi, A., [34]	2021	Blood Safety	<p>Found a relatively high prevalence of TTIs in Tanzania compared to some countries in sSA, in which the overall prevalence of TTIs was 10.1% (10,226 out of 101,616) with HBV accounting for 5.1% (5264 out of 101,616). Being a replacement donor was associated with all the four types of TTIs (HIV, HBV, HCV, and syphilis).</p>
Chimba, R., [35]	2021	Blood Safety	<p>Noted the presence of the NBTS, and its success in evolving into a “coordinated and centralized system based on voluntary non-remunerated blood donors.” The paper also noted that NBTS met only 86% of national blood collection target.</p>
Mathias, I. S., [36]	2021	Blood Safety	<p>Found that “discard rate of blood and blood component units was 2.48% and the main reason for discarding blood and blood components was TTIs, followed by plasma prepared after 24 hours of collection of blood.”</p>
Ministry of Health [37]	2022	Blood Safety	<p>Existence of the NBTS which was established in 2004 (in line with the WHA Resolution 28.72 of 1975), through “Cooperative Agreement (CoAg) between United States Government and Government of Tanzania, through the support of PEPFAR funding”. The NBTS is “mandated to collect blood from voluntary non remunerated blood donors, processing and distribution of blood to all Hospitals in the country free of charge”.</p>
Eriksen, H. M., [38]	2003	Infection prevention and control	<p>A prospective survey of SSI conducted in general surgery department at Kilimanjaro Christian Medical Center. Finding showed that incidence of SSI was 19.4%; and that 87% of those who developed SSI had received antibiotic prophylaxis.</p>
Gosling, R., [39]	2003	Infection prevention and control	<p>A point-prevalence study, in which “on the day of the study, there were 412 inpatients (in 15 ward areas) and 61 cases of HAIs were identified, giving an overall HAIs prevalence of 14.8%.” High prevalence was seen in “medical intensive-care unit (40%); surgical (orthopaedic and general surgery) wards (36.7%); and one of the general medical wards (22.2%)”.</p>
Ndugulile, F., [40]	2005	Infection prevention and control	<p>Results showed that 39 Gram-negative bacteria were isolated from clinical samples of 39 patients; out of which 11 (28.2%) were extended spectrum beta-lactamase (ESBL) producing.</p>
Fehr, J., [41]	2006	Infection prevention and control	<p>Results revealed an incidence of SSI of 24% in a district hospital in Tanzania. Also, the study noted on the emergence of multidrug-resistant bacteria, such as “methicillin-resistant <i>Staphylococcus aureus</i> and gram-negative pathogens expressing broad-spectrum beta-lactamases.”</p>

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Winani, S., [42]	2007	Infection prevention and control	Assessed the effectiveness of an intervention involving the use of a single-use delivery kits in combination with education aiming at preventing cord infection and puerperal sepsis. Findings showed that: “ <i>newborns whose mothers used the delivery kit were 13.1 times less likely to develop cord infection than infants whose mothers did not use the kit. Furthermore, women who used the kit for delivery were 3.2 times less likely to develop puerperal sepsis than women who did not use the kit. Women who bathed before delivery were 2.6 times less likely to develop puerperal sepsis than women who did not bathe, and their infants were 3.9 times less likely to develop cord infection.</i> ”
Kayange, N., [43]	2010	Infection prevention and control	The study determined the prevalence of neonatal sepsis, predictors of positive blood culture, deaths and antimicrobial susceptibility. Results showed that 38.9% (300 out of 770 neonates admitted during the study period had neonatal sepsis by WHO criteria, out of whom 121 (40%) and 179 (60%) had early and late onset sepsis respectively. Positive blood culture was found in 57 (47.1%) and 92 (51.4%) among neonates with early and late onset neonatal sepsis respectively. Deaths occurred in 57 (19%) of neonates. Factors that predicted deaths were positive blood culture with multidrug-resistant gram-negative bacteria.
Mawalla, B., [44]	2011	Infection prevention and control	SSI was detected in 65 (26.0%) patients at Bugando Medical Centre Mwanza, of whom 86.2% (56/65) had positive aerobic culture; in which <i>S. aureus</i> was the predominant organism 16/56 (28.6%). Having “ <i>pre-morbid illness, use of drain, iodine alone in skin preparation, prolonged duration of operation, and cigarette smoking</i> ” predicted SSI.
Manyahi, J., [45]	2014	Infection prevention and control	In a total of 100 patients, swabs were collected, out of which 90 (90%) had positive aerobic bacterial growth. A total of 147 pathogenic bacteria were isolated in which 63% (93/147) were multiple-drug resistance isolates; and about 90% were resistant to more than four classes of antibiotics.
Jones, M., [46]	2015	Infection prevention and control	Assessment of practice change among health care workers (HCWs) who received training 12 months after the training showed positive changes in their practice.
Joachim, A., [47]	2018	Infection prevention and control	“A cross-sectional study was conducted between June and October 2016 among HCWs in tertiary and regional hospitals in Dar es Salaam, to determine the MRSA nasal carriage rate. Among 379 HCWs enrolled, 157/379 (41.4%) were colonized with <i>S. aureus</i> , of whom 59 (37.6%) were MRSA carriers giving an overall prevalence of 59/379 (15.6%). MRSA carriage was high among HCWs in Temeke (56.9%) and Amana (37.5%) regional hospitals. A high proportion of MRSA carriage was detected among nurses (35, 45.5%).”
Nkuwi, E. J., [48]	2018	Infection prevention and control	Determination of the magnitude and distribution of MRSA contamination among various items in patients’ care surroundings at Muhimbili National Hospital. Results showed that: “ <i>a total of 200 environmental samples from high touch items were processed, out of these MRSA was 19.5%. Patients’ beds surfaces were the most contaminated among studied items (43.7%), whilst the surgical trolleys were least contaminated (7.7%). Presence of 10 or more patients in a room was an important significant correlate for MRSA contamination.</i> ”

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Kiponza, R., [49]	2019	Infection prevention and control	<p>Recruited 197 women, of whom “50.3% had spontaneous vaginal delivery, while 49.2% had caesarean section. Bacteraemia was detected in 22 (11.2%) women, along with 86 (43.6%) isolated from endocervical swabs.” In the study puerperal sepsis was mostly caused by <i>E. coli</i> and <i>Klebsiella spp</i>, which showed very high levels of resistance to most antibiotics used in empirical treatment.</p> <p>Assessed the “relationship between <i>S. aureus</i> colonization of patients and HCWs, and subsequent development of SSIs. Among 930 patients screened for <i>S. aureus</i> on admission, 129 (13.9%) were positive of which 5.4% (7/129) were MRSA. Amongst 363 patients rescreened on discharge, 301 patients had been tested negative on admission of whom 29 (9.6%) turned positive after their hospital stay. Three (10.3%) of the 29 acquired <i>S. aureus</i> were MRSA. <i>S. aureus</i> contributed to 21.1% (n = 12) of the 57 cases of SSIs among 536 patients followed”.</p>
Moremi, N., [50]	2019	Infection prevention and control	<p>Estimation of the prevalence of puerperal sepsis and documentation of factors and causes among postnatal women who attended postnatal care at Kilimanjaro Christian Medical Centre in the year 2015. The prevalence of puerperal sepsis was 11.5% (21/183); in which its most common factors and causes included caesarean section 66.7% (14/21), postpartum haemorrhage 57.1% (12/21), moderate to severe anaemia 61.9% (13/21), prolonged labour 76.2% (16/21), and bacterial infection 90.5% (19/21). “<i>Staphylococcus spp</i> was found to be a predominant isolate which causes puerperal sepsis followed by <i>E. coli</i> and <i>Streptococcus spp</i>.”</p>
Kajeguka, D.C., [51]	2020	Infection prevention and control	<p>Analysis of IPC data from star rating assessment dataset involving a total of 2131 healthcare facilities at baseline (in 2015/2016) and 2185 at reassessment (in 2017/2018). Adherence to IPC principles in primary health care facilities in Tanzania increased from 31% during baseline assessment to 57% in reassessment after quality improvement plan interventions were implemented.</p>
Kinyenje, E., [52]	2020	Infection prevention and control	<p>The overall prevalence of Bloodstream infections was 11.4% (46/402) with a case fatality rate of 37%. The majority of bacteria (70.5%) isolated from patients with Bloodstream infections were multi-drug resistant. Predictors for mortality were positive blood culture, admission to ICUs, and multi-drug resistant bacteria.</p>
Manyahi, J., [53]	2020	Infection prevention and control	<p>Compliance of HCWs in outpatient settings of private and faith-based health facilities to IPC principles was inadequate, especially for: “hand hygiene 6.9% (n = 8655 indications); glove use 74.8% (n = 4915); disinfection of reusable equipment 4.8% (n = 841); and waste management 43.3% (n = 4299)”.</p>
Powell-Jackson, T., [54]	2020	Infection prevention and control	<p>An intervention to improve HCWs compliance with hand hygiene through a combination of WASH interventions and training showed significantly improvement in intervention facilities compared to non-intervention facilities.</p>
Wiedenmayer, K., [55]	2020	Infection prevention and control	<p>Assessment of the ICU nurses’ knowledge, compliance, and barriers toward evidence-based guidelines (EBGs) for the prevention of ventilator-associated pneumonia (VAP). The results showed that: “Mean knowledge score was 3.86 (SD = 1.56), based on ten questions (equivalent to 38.6%). Nurses with a degree or higher level of nursing education performed significantly better than the nurses with a diploma or lower level of nursing education (p = 0.004). The mean self-reported compliance score for EBGs for the prevention of VAP was 15.20 (SD = 0.93) which is equivalent to 60.8% based on 25 questions. The main barriers to the implementation of EBGs for VAP prevention were lack of skills (96.6%), lack of adequate staff (95.5%), and lack of knowledge (79.3%).”</p>
Bankanie, V., [56]	2021	Infection prevention and control	

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Gon, G., [57]	2021	Infection prevention and control	An evaluation of effectiveness of an educational intervention aimed at improving environmental hygiene in a pilot study in three high-volume maternity and newborn units in Dar es Salaam. Microbiological cleanliness improved during the study period; while improvement in cleaning actions was seen only in the pre-training period. It was also considered that the intervention could be implemented in the Tanzanian context. Issues that affected its implementation included a low number of training sessions at the hospital level, lack of supportive supervision, and lack of regular cleaning supplies.
Hokororo, J., [58]	2021	Infection prevention and control	Compliance to IPC standards between 2010 and 2017 in assessed health facilities (“ <i>Hospitals at National, Zonal, Regional and District [Council] Level as well as Health Centers where a District/ Council Hospital was not available between 2010 and 2017</i> ”) was low. At baseline in 2010 compliance was 32%; in 2014 compliance was 53 %; and in 2017 the compliance was low again to 34%.
King, J. J. C., [59]	2021	Infection Prevention and control	Compliance with IPC practices was observed in 8181 (56.9%) of 14,366 indications in intervention facilities and 8336 (54.7%) of 15,242 indications in control facilities (absolute difference 2.2 percentage points, 95% CI -0.2 to -4.7; $p = 0.071$).
Rasmussen, L. V., [60]	2021	Infection prevention and control	Assessment of the impact of a criterion-based audit on IPC and knowledge during vaginal delivery at a hospital. Results showed that: “ <i>Hand washing increased significantly after a procedure from 46.7% to 80% (RR = 1.71 95% CI; 1.27 to 2.31), the use of alcohol-based hand rub before a procedure from 1.7% to 33.3% $p < 0.001$, and the use of alcohol-based hand rub after procedure from 0% to 30% $p < 0.001$. After the intervention the mean score for the knowledge test increased insignificantly from 59.3% to 65.3%, (mean difference = 6.1%, 95% CI; -4.69 to 16.88)</i> ”.
Rayson, D., [61]	2021	Infection prevention and control	Compared reported hand hygiene compliance and level of microbiological contamination of hands of HCWs in 18 health care facilities in Mwanza Region. Findings indicated that 26.4% of hands of HCWs had bacterial contamination, which mismatched self-reported compliance with hand hygiene.
Seni, J., [62]	2021	Infection Prevention and control	The study was conducted to delineate the potential sources of multi-drug-resistant bacteria for specific mitigation strategies among orthopaedic patients. Results showed that: 47.2% (125/265) of index patients; 77.8% (14/18) of neighbouring patients; 8.3% (2/24) of HCWs; 72.2% (13/18) of non-medical caregivers; and 31.4% (27/86) of samples taken from the hospital environment had ESBL producers. Patients with open fractures had increased odds of being colonized with ESBL producers; and the floor below patients’ beds was commonly contaminated.
Manyahi, J., [63]	2022	Infection Prevention and control	Assessed the burden of and risk factors for multi-drug resistant (MDR) bacteria among patients admitted in ICU. Findings indicated that MDR bacteria are common in patients admitted to ICU, hence, recommended for simple screening methods.

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Ndomba, A. L. M., [64]	2022	Infection Prevention and control	Study at Bugando Medical Centre, involving patients with long-term and short-term indwelling urinary catheterization (IUC) from December 2016 to September 2017. Catheter-associated urinary tract infection (CA-UTI) was the leading (56.8%; 250/440) complication among patients with IUC. CA-UTI was significantly higher among out-patients than in-patients (82.2% <i>versus</i> 35.3%, $p < 0.001$). Older age, level of education, and catheter duration of ≥ 6 weeks independently predicted CA-UTI among outpatients; while female gender, catheter bags not freely hanging, and residing outside Mwanza region predicted CA-UTI among in-patients. Involvement of patients and carers in IPC measures in out-patients living with IUC was recommended.
Hutin, Y.J., [65]	2003	Injection Safety	In Tanzania: in the year 2000, the annual number of injections per person was 2.0
Reid, S.R., [66]	2010	Injection Safety	Discussed the fear of community in rural areas on injections prescribed for treatment of severe malaria, in which community feared that it could affect (kill) a child with severe malaria. In most cases, the fear arose from unsafe injections due to bacterial contamination (nosocomial bloodstream infections).
Nilsson, J., [67]	2013	Injection Safety	Cross sectional descriptive study, conducted between June and August 2011 at a regional public hospital in the northern part of Tanzania. Majority of staff had: good knowledge on injection safety practices; good knowledge on HIV as a risk factor; less knowledge about other blood-borne infections. Also, the hospital needed a well-functioning incinerator and sufficient medical supplies.
Hayashi, T., [68]	2019	Injection Safety	In the period of 2011-2015: Frequency of health care injection per person per year was 0.90 (n = 16,780); and (Safety)-Use of an unopened syringe or needle was 97.6% (n = 4786).
Adewuyi, E. O., [69]	2020	Injection Safety	A meta-analysis of Demographic and Health Surveys (2010-2017) in which data for Tanzania used was for 2015-2016 and number of participants was 16,780; the: <ul style="list-style-type: none"> ▪ Average injections per person per year was 1.0; ▪ Prevalence of medical injections, % (95% CI) was 28.5 (27.8 - 29.2); and ▪ Access to new syringe and needle, % (95% CI) was 98.3 (98.0 - 98.7).
Nyamuryekung'e, M.K., [70]	2021	Injection Safety	A case report on cannulation procedure to a patient showing that “ <i>reinsertion of the guide needle into the plastic sheath in situ most probably caused cannula fracture.</i> ” The finding is important for ensuring safety during cannulation procedure by reminding clinicians that “ <i>guide needle’s reinsertion may result in cannula fracture.</i> ”
Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC) [71]	2018	Blood Safety Infection Prevention and Control Injection Safety	A strategic plan on control of Viral Hepatitis (HBV and HCV) from 2018 to 2023 with several priority areas, which include: <ul style="list-style-type: none"> ▪ <i>Priority area 2 (Blood safety):</i> 1) <i>Strengthen clinical evaluation and HBV and HCV risk factors assessment before blood donation including referral for those found to be infected;</i> 2) <i>ensure 100% of all donated blood units are screened in a quality assured manner as per WHO standards for HBV and HCV;</i> ▪ <i>Priority area 3 (Infection prevention and control–injection safety): including strengthening infection prevention and control–injection safety in health facilities, and national blood transfusion services.</i>

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Ministry of Health and Social Welfare (MoHSW) [Tanzania Mainland] [72]	2015	Injection Safety Infection Prevention and control	In Tanzania Mainland, the data from the Tanzania Service Provision Assessment Survey (TSPA) 2014-15 revealed that: <ul style="list-style-type: none"> ▪ Safe final disposal of sharps wastes was at 33%; ▪ Appropriate storage of sharps waste was at 80%; ▪ Availability of single-use standard disposable syringes with needles or else auto-disable syringes with needles available in the general outpatient area was 76%.
Tanzania Food and Drug Authority [73]	2010	Medication Safety	National guidelines on monitoring of medicines safety, which cover key issues such as: pharmacovigilance systems in Tanzania; roles of various parties; reporting of adverse drug reactions (including patient reporting); assessment of adverse drug reactions reports; and communicating with reporters and other stakeholders. <p>Assessment (from July to December 2018) of the functionality and identification of strengths and limitations of the national pharmacovigilance systems in Ethiopia, Kenya, Rwanda, and Tanzania. Results indicated that for Tanzania (Mainland):</p> <ul style="list-style-type: none"> ▪ “The pharmacovigilance system is supported by law and regulations”; ▪ “Standard operating procedures for receiving, processing, and communicating suspected adverse event reports were in place, but reporting of suspected medicine-related harm from stakeholders was inadequate”; ▪ “The number of Individual Case Safety Reports received by the national medicine regulatory authority was 4.1 per million inhabitants”; ▪ “Overall, ≤1% of the total number of health facilities submitted Individual Case Safety Reports”; ▪ “Tanzania had a designated budget for pharmacovigilance activities and an electronic Individual Case Safety Reports reporting system;” and ▪ That the “national pharmacovigilance system did not have access to data on drug utilization.”
Barry, A., [74]	2020	Medication Safety	A report on status of diagnostic X-ray machines in Tanzania focusing on quality control and preventive maintenance. Results of preventive maintenance helped the “government to introduce a rehabilitation project to service X-ray units and replace nonoperational X-ray units,” and the quality control findings helped to introduce an “X-ray maintenance retraining programs.”
Sungita, Y. Y., [75]	2006	Radiation Safety	Radiographers were not implementing quality control measures adequately; hence risking ability to reveal timely equipment that are not functioning. This may result in “poor image quality and/or higher dose to patients.”
Ngoye, W.M., [76]	2015	Radiation Safety	Demonstrated “the potential for optimization of radiation protection using simple and inexpensive techniques”. Lack of Medical Physicists has been shown to be one of the challenges affecting radiation safety
Muhogora, W., [77]	2017	Radiation Safety	Results showed that: “dose rates > 10 µSv/hr were recorded at viewing windows, walls and doors of control cubicles and behind the doors of changing cubicles. These dose rates indicating higher health risk to workers and member of public.”
Nkuba, L. L., [78]	2017	Radiation Safety	Closing remarks to participants of a training that aimed at building capacity of staff from “health facilities across the country in order for them to provide quality services and ensure quality radiation care with high precautions being taken to reduce the potential hazard from radiation exposure if laws and procedures are not followed.”
Ngamilo, P.G. [79]	2019	Radiation Safety	

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Tanzania Atomic Energy Commission [80]	2020	Radiation Safety	Remarks were given to participants of a five (5) days Advanced National Radiation Safety Training Course organized by Tanzania Atomic Energy Commission (TAEC) in Arusha. <i>The training aimed to equip participants with knowledge of ensuring safety to the Tanzanians against the possible health effects of radiation. The content aimed at making the participants more aware of the effects of radiation; the recommended dose limits in the course of practices, how to reduce the likelihood of the impacts of radiation exposure in their workplaces, and how to protect themselves by adhering to national and international safety guidelines.</i>
Kawooya, M.G., [81]	2022	Radiation Safety	Identified four key points for radiation safety in Africa namely: <i>“Global health themes increased interest for quality and safe imaging in Africa”; “collaboration, training and research are catalysts to quality and safety transition in Africa”; “COVID-19 has affected quality and safety for imaging in Africa”; and “Technologies like machine learning and artificial intelligence are key to enhance quality and safety.”</i>
Haynes, A.B., [82]	2009	Safe Surgery	Between October 2007 and September 2008, St. Francis Hospital in Ifakara was one of eight hospitals that participated in the <i>“WHO’s Safe Surgery Saves Lives program”</i> . <i>“Introduction of the WHO Surgical Safety Checklist use in operating rooms in the eight hospitals was associated with marked improvements in surgical outcomes. Postoperative complication rates fell by 36% on average, and death rates fell by a similar amount.”</i>
Beard, J.H., [83]	2014	Safe Surgery	Found that: <ul style="list-style-type: none"> ▪ <i>“Nonphysician clinicians (NPCs) performed 55.8% of nonobstetric major surgical procedures (MSPs) followed by surgical specialists (28.7%) and medical officers (15.5%). The most common nonobstetric MSPs performed by NPCs were elective groin hernia repair, prostatectomy, exploratory laparotomy, and hydrocelectomy”;</i> ▪ <i>“Postoperative mortality was 1.7% and 1.5% in cases done by NPCs and physicians respectively”;</i> and ▪ <i>“There was no significant difference in outcomes after procedures performed by NPCs compared with physicians.”</i>
Epiu, I., [84]	2016	Safe Surgery	Assessment of knowledge and attitudes of anaesthetists towards the use of the WHO surgical checklist, revealed that at Muhimbili National Hospital 65% of anaesthetists interviewed used the checklist.
Epiu, I., [85]	2017	Safe Surgery	Assessed the capacity to provide safe anesthetic care for mothers in five (5) main referral hospitals in East Africa (Uganda, Kenya, Tanzania, Rwanda, and Burundi); in which for Tanzania it involved Muhimbili National Hospital. <ul style="list-style-type: none"> ▪ Tanzania has a workforce density of 0.05 anesthesiologists per 100,000 population. ▪ Noted shortage of personnel and equipment needed to provide safe anesthetic care for obstetric surgical cases. ▪ Findings called for the need to: <i>“increase the number of physician anesthetists; improve the training of nonphysician anesthesia providers; and to develop management protocols for obstetric patients requiring anesthesia”</i>.

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Cavallaro, F.L., [86]	2018	Safe Surgery	<p>Found that:</p> <ul style="list-style-type: none"> ▪ “43% of caesarean sections in Tanzania in 2014-15 were performed in facilities meeting the three readiness indicators (availability of consistent electricity, 24-hour schedule for caesarean and anaesthesia providers, and availability of all general anaesthesia equipment). ▪ “Consistent electricity was widely available, and 24-hour schedules for caesarean and (less systematically) anaesthesia providers were observed in most facilities; however, the availability of all general anaesthesia equipment was the least commonly reported indicator, present in only 44% of all facilities (34% of public hospitals)”.
Alidina, S., [87]	2019	Safe Surgery	<p>A protocol for the implementation of Safe Surgery 2020 with the hypothesis that the intervention will: 1) increase adherence to surgical quality processes around safety, teamwork and communication and data quality in the short term; and 2) reduce complications from SSIs, postoperative sepsis and maternal sepsis in the medium term.</p>
Citron, I., [88]	2019	Safe Surgery	<p>A detailed description of the development process and outcome of the National Surgical, Obstetric and Anaesthesia Plan in Tanzania, which aims at improving the quality and access to surgical, obstetric and anaesthesia care.</p>
Fast, O., [89]	2019	Safe Surgery	<ul style="list-style-type: none"> ▪ Evaluated the impact of education and training of HCWs on sterile processing practices at 10 hospitals in Lake Zone in 2018; ▪ The “education and follow up support for HCWs in sterile processing resulted in increased knowledge of best practices, application of knowledge in practice settings, and awareness of issues that need to be overcome to decrease risks for patients”.
Nyberger, K., [90]	2019	Safe Surgery	<p>A systematic literature review to understand the situation of surgical, obstetric, and anaesthesia in Tanzania, that helped to develop the Tanzania National Surgical, Obstetric, and Anaesthesia Plan by informing on priorities to be included.</p>
Pittalis, C., [91]	2019	Safe Surgery	<p>A protocol for a project which aimed to strengthen the capacity of hospitals at district level to provide safe surgery with two key interventions: quarterly supportive supervision by Specialists from referral hospitals; and using mobile phones to provide phone consultations with surgical providers at district level hospitals.</p>
Gajewski, J., [92]	2020	Safe Surgery	<p>An assessment of capacity of hospitals at district level to provide anaesthesia conducted from July to November 2017; which found that:</p> <ul style="list-style-type: none"> ▪ Anaesthesia is provided only by nonphysician anaesthetists; ▪ The Personnel, Infrastructure, Procedures, Equipment and Supplies (PIPES) index score ($M = 8.4$); and ▪ Among the key challenges affecting capacity to provide anaesthesia were nonavailability of functioning anaesthesia machines; and shortage of staff and other equipment.
Hellar, A., [93]	2020	Safe Surgery	<p>Studied the feasibility of implementing the surgical safety checklist in 40 HFs in two regions of Tanzania between January and December 2018, using a team-based approach. The findings have indicated that it is feasible to implement a surgical safety checklist in settings with lower-resources.</p>

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Kapologwe, N.A., [94]	2020	Safe Surgery	<p>An analysis of facility infrastructure, showed that:</p> <ul style="list-style-type: none"> “Between 2015 and August 2019, a total of 419 (8.3%) health facilities (350 health centers and 69 District Council Hospitals) were either renovated or constructed and equipped to offer safe surgery services. Of all Health Centers, only 115 (22.2%) were offering the CEMONC services. Of the 115 health centres, only 20 (17.4%) were offering the CEMONC services with all 9 - signal functions and only 17.4% had facilities that are offering safe blood transfusion services.”
Lodge, W., [95]	2020	Safe Surgery	<p>The authors found and reviewed 68% of all medical records of 157 patients who were diagnosed with SSI and sepsis. “Among the records reviewed, approximately one-third (34%) and one quarter (23%) included documentation of SSI and sepsis diagnoses, respectively. 6% of reviewed records included documentation of all SSI and sepsis diagnoses, symptoms and vital signs, inpatient daily monitoring indicators, and demographic data.”</p> <p>This shows a need for strengthening data quality and record-keeping which are essential elements “for surgical team communication, continuity of care, and patient safety, especially in low resource settings where paper-based records are the primary means of data collection”.</p>
Swallow, A.Y., [96]	2020	Safe Surgery	<ul style="list-style-type: none"> A total of 842 patients were primarily operated at Muhimbili National Hospital, of whom 64 (7.6%) had required an on-demand relaparotomy. Also, other 37 patients were admitted having undergone surgery outside Muhimbili National Hospital and required urgent relaparotomy; making a total of 101 patients who underwent relaparotomy. Overall mortality rate among patients who underwent relaparotomy was 39.6%. This requires interventions to address predictors of relaparotomy, as well as improvement of post-operative care at the hospital.
van Heemskerken, P., [97]	2020	Safe Surgery	<p>Barriers to surgery performed by NPCs were grouped into four categories: “1) primary outcome (<i>inadequate surgical skills, inadequate diagnostic skills in respect to the complexity of cases managed by NPCs and unsatisfactory outcomes of surgery performed by NPCs</i>); 2) NPCs workforce (<i>inadequate preservice/inservice training, NPCs training does not adequately cover surgical theory and clinical practice, NPCs appear not always sufficiently prepared for their future working environment and that little attention is being given to continuous medical education after initial training</i>); 3) Regulation (<i>regulations and coordination surrounding NPCs, and that there is a general absence of job descriptions for surgically active NPCs</i>); and 4) Environment and resources (<i>infrastructure and supplies, shortages of medicines</i>).”</p>
Alidina, S., [98]	2021	Safe Surgery	<p>Evaluation of outcomes of a multicomponent safe surgery showed improvement in: safety practices by an additional 20.5% and teamwork and communication conversations by 33.3% in intervention facilities compared to control facilities. Also, maternal sepsis rates reduced significantly to 1% (from 14%); and documentation completeness improved by 41.8% for sepsis and 22.3% for SSI.</p> <ul style="list-style-type: none"> The results support the emerging evidence that improving surgical quality in a low-resource setting requires a focus on the surgical system and culture.

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Alidina, S., [99]	2021	Safe Surgery	<ul style="list-style-type: none"> ▪ Application of the Exploration, Preparation, Implementation, Sustainment (EPIS) framework to inform the implementation of a multicomponent Safe Surgery intervention to improve the quality of surgical services. ▪ Using the EPIS framework in understanding the implementation of surgical services interventions can help to improve quality and ensure sustainability.
Alidina, S., [100]	2021	Safe Surgery	<p>The health facilities that performed well in the implementation of “<i>Safe Surgery 2020 interventions</i>” had a culture of teamwork which “<i>helped to improve surgical ecosystems holistically on safety practices, teamwork and communication</i>”.</p>
Alidina, S., [101]	2021	Safe Surgery	<p>The success of the “<i>Safe Surgery 2020</i>” intervention was shown to be contributed by the following factors:</p> <ol style="list-style-type: none"> 1) “<i>the intervention’s design, including its multimodality, side-by-side mentorship, and standardization of practices</i>”; 2) “<i>the mentee-mentor relationship, including a friendly, safe, non-hierarchical, team relationship, as well as mentors’ understanding of the local context</i>”; and 3) “<i>mentorship characteristics, including non-judgmental feedback, experience, and accessibility. Challenges included resistance to change, shortage of providers, mentorship dose, and logistics</i>”.
Clarke, M., [102]	2021	Safe Surgery	<p>Assessment of surgical monitoring and quality control systems at the district hospitals in Malawi, Tanzania and Zambia. The results for Tanzania in which the number of district hospitals assessed was 30 revealed that the percent of district hospitals that:</p> <ul style="list-style-type: none"> ▪ Used Surgical Safety Checklists was 33% (10/30); ▪ Conducted internal supervision was 83% (25/30); ▪ Received external supervision was 0% (0/30); ▪ Conducted case reviews was 73% (22/30); ▪ Produced regular morbidity and mortality reports was 30% (9/30); and ▪ Conducted audits of surgical adverse events was 7% (2/30).
Ernest, E.C., [103]	2021	Safe Surgery	<p>Evaluation of the impact of a multicomponent safe surgery intervention in Tanzania, which showed that the “<i>proportion of women with SSI after caesarean section reduced from 14% during baseline to 1% (p = 0.002). The caesarean section-related perioperative mortality rates decreased by 38.5% after the implementation of safe surgery interventions.</i>”</p>
Hayirli, T.C., [104]	2021	Safe Surgery	<p>Description of the process used to develop and validate content of “<i>Safe Surgery Organizational Readiness Tool</i>”. The Tool has 14 domains and 56 items for measuring readiness of health facilities in LMICs to implement safe surgery and quality improvement interventions.</p>
Kotwica, A., [105]	2021	Safe Surgery	<p>Assessed impact of a training intervention (Paediatric ENT Skills and Airway Course) that aimed to minimize post-operative morbidity and mortality in paediatric surgery at a Zonal Referral Hospital in Northern Tanzania. Findings have shown that the training has a potential for building “<i>team cooperation in the care of patients</i>”, which ultimately can ensure safety of patients in paediatric surgery.</p>

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Wurdeman, T., [106]	2021	Safe Surgery	Measurement of the effect of the implementation of Safe Surgery 2020 interventions in Lake Zone (from May 2018 to February 2019) found that: “the overall average in-hospital non-obstetric postoperative mortality rate for all surgery procedures was 2.62%. The postoperative mortality rates for laparotomy were 3.92% and for cesarean delivery was 0.24%.”
Wurdeman, T., [107]	2022	Safe Surgery	Compliance with safe surgery checklist was found to be associated with “lower rates of maternal sepsis (<25% adherence: 5.0%; >75% adherence: 0.7%). Wound class and facility type were significantly associated with development of maternal sepsis (Wound class: Clean-Contaminated 3.7%, Contaminated/Dirty 20%, $p = 0.018$) (Facility Type: Health Centre 5.9%, District Hospital 4.5%, Regional Referral Hospital 1.7%, $p = 0.018$).”

4. Discussion

The literature on patient safety in Tanzania has covered a lot of issues that can inform ongoing efforts for further improvement. In the area of blood safety, key issues covered include blood donors (focusing on voluntary; non-remunerated donors; their education; increasing their pool through public health-driven iron deficiency anaemia prevention and treatment programmes; and establishing blood conservation policies); TTIs; the need for implementation of international safety standards and quality management systems; establishing reliable country-based funding for compensating the decreased external donor funding; strengthening regulation and control of blood and blood products; as well as, hemovigilance function of national regulatory authority. Also, a need for strengthening clinical evaluation and HBV and HCV risk factors assessment before blood donation; and strengthening IPC-injection safety in national blood transfusion services have been emphasized. The established NBTS through the support of the United States Government in 2004 has been very instrumental towards strengthening of blood safety at all levels of service delivery. Strengthening efforts for accreditation of the Zonal NBTS Centres and implementation of quality management systems coupled with country efforts to ensure the availability of adequate funding is key in maintaining blood safety in Tanzania [108].

In the IPC area, key topics explored include: healthcare-associated infections (HAIs); SSIs, MDR organisms; preventing *newborns* cord infection and puerperal sepsis; neonatal sepsis with MDR gram-negative bacteria; Impact of training on practice change; MRSA nasal carriage rate among HCWs; MRSA contamination among various items in patients’ care surroundings; adherence to IPC principles in primary health care facilities; bloodstream infections with MDR bacteria; compliance of HCWs in outpatient settings of private and faith-based health facilities to IPC principles; compliance with hand hygiene; ICU nurses’ knowledge, compliance, and barriers toward EBGs for prevention of VAP; Educational intervention for improving environmental hygiene; compliance to IPC standards in health facilities; criterion-based audit on IPC and knowledge during

vaginal delivery at a hospital; hand hygiene compliance and level of microbiological contamination of hands of HCWs; sources of MDR bacteria for among orthopaedic patients.; CA-UTI among patients with long-term and short-term indwelling urinary catheterization. The prominence of MDR bacteria in the literature is in line with the recent global report on burden bacterial AMR in 2019 [109]; hence, strengthening IPC interventions is critical at all levels of service delivery in Tanzania. The burden of AMR also requires concerted efforts across many sectors; therefore, the lessons learned so far on improving multisectoral coordination need to be sustained and further explored to inform on the best practices [110]. Prevention of HAIs in neonatal units in Tanzania can also benefit from the implementation of “*the 3 + 1 Classification Framework*” which consists of “1) *Primary prevention*, 2) *Detection*, 3) *Case management, and Implementation (3 + 1)*”, as put forward by Molina García and colleagues [111].

Injection safety practices have improved significantly in the past two decades. Key aspects explored in the literature include the number of injections per person; unsafe injections and nosocomial bloodstream infections; knowledge of injection safety practices; use of unopened syringe or needle; access to new syringe and needle; canulation procedure; strengthening injection safety in national blood transfusion services; safe disposal of sharps wastes; storage of sharps waste; and availability of auto-disable syringes. Medication safety is the least explored area in which the literature has focused on: pharmacovigilance systems and reporting of adverse drug reactions, as well as an analysis of the strengths and limitations of the national pharmacovigilance systems.

Radiation safety focused on the following: quality control and preventive maintenance of diagnostic X-ray machines; quality control implementation by radiographers; optimization of radiation protection using simple and inexpensive techniques, and lack of Medical Physicists as one of the challenges affecting radiation safety; high radiation dose rates recorded at viewing windows, walls and doors of control cubicles and behind the doors of changing cubicles (risking workers and external clients); capacity building of staff from health facilities to enable them to provide quality services, and ensure quality radiation care with high precautions being taken to reduce the potential hazard from radiation exposure, which was organized by TAEC; and a need for enhance collaboration, training and research, and investing in technologies like machine learning and artificial intelligence in order to catalyze radiation quality and safety. The good work done by the Tanzania Government in expanding the training of required human resource is commendable and need to be coupled with the implementation of quality management and assurance systems to ensure the safe use of radiation technologies and strengthening national regulatory system to ensure safety in collaboration with the International Atomic Energy Agency [112].

Safe surgery has been extensively explored in the literature covering all the key topics such as: introduction of the WHO Surgical Safety Checklist use in operating rooms; outcomes of procedures performed by NPCs as compared to physi-

cians; knowledge and attitudes of anaesthetists towards use of the WHO surgical checklist; capacity to provide safe anesthetic care for mothers; Health facilities meeting the three readiness indicators for performing caesarean sections in Tanzania in 2014-15; Safe Surgery 2020 intervention implementation in Lake Zone, which aimed at increasing adherence to surgical quality processes around safety, teamwork and communication, data quality, and reduce complications from SSI, postoperative sepsis, and maternal sepsis; development process and outcome of the National Surgical, Obstetric and Anesthesia Plan in Tanzania; impact of education and training of HCWs on sterile processing practices; strengthening capacity of hospitals at district level to provide safe surgery through quarterly supportive supervision by Specialists from referral hospitals, and using mobile phones to provide phone consultations with surgical providers; capacity of hospitals at district level to provide anesthesia using the Personnel, Infrastructure, Procedures, Equipment and Supplies (PIPES) index score; health facilities infrastructure and provision of CEMONC services; data quality and record keeping in documentation of SSI and sepsis for improving surgical team communication, continuity of care, and patient safety; relaparotomy and mortality rate; impact of implementation of surgical monitoring and quality control systems at district hospitals; development and validation of content of “*Safe Surgery Organizational Readiness Tool*”; and *assessment of outcome of a Paediatric ENT Skills and Airway Course*.

Guided by HSSP V and its costing, the Tanzania Ministry of Health plans to develop and implement National Patient Safety Guideline; [113] [114] as part of complying with the requirement from the 72 WHA [15] and the 74 WHA [24] as well as the WHO Global Patient Safety Action Plan. [4] The Ministry will also work to establish a system for incident reporting as well as a procedure for analysis of incident reports in order to enable health facilities and health management teams at all levels to learn from incidents and hence set strategies to prevent their recurrence [115].

Tanzania can also benefit from continued implementation of the “*5S-KAIZEN-TQM approach*” in health facilities as a foundational intervention of quality improvement efforts in health facilities given its potential to improve safety in general including its contribution to improvement in cleanliness and health care waste management in health facilities [116] [117] [118].

The study has the following two limitations: first, we have searched the following databases—PubMed, PubMed Central, and Google; therefore, we may have missed some other literature that is published in journals that are not indexed in PubMed and PubMed Central. Secondly, the aim of the rapid review was to identify the literature on patient safety in Tanzania in terms of its key findings and issues in order to inform future improvement steps; in the execution of the review, we may not have adequately fulfilled all the steps but we believe we have tried to the best to be comprehensive and transparent as possible in the process [119]. The results obtained are adequate for informing and understanding of patient safety

efforts in the past two decades (2002-2022); and hence, can contribute to future efforts to ensure patient safety in Tanzania for the period 2022-2030.

5. Conclusion

In the past two decades (2002-2022), a lot of efforts have been done to ensure patient safety in Tanzania, as evident from the rapid literature review. Most of the identified literature was on IPC and safe surgery, followed by blood safety, radiation safety, injection safety and medication safety. The literature on IPC has highlighted the need for further strengthening of the efforts to address AMR. The results of the implementation of the safe surgery 2020 intervention in Lake Zone were promising; therefore, the Ministry of Health needs to consider scale-up of its implementation to other zones taking into account the lessons learned. The hemovigilance function and pharmacovigilance functions by the TMDA need to be strengthened to ensure blood safety and medication safety respectively. Strengthening the implementation of quality management and assurance systems to ensure the safe use of radiation technologies, as well as strengthening national regulatory system (through the TAEC) in collaboration with the International Atomic Energy Agency is essential for radiation safety.

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Authors Contributions

ESE—conceptualization of the manuscript, article searching, data extraction and initial drafting of the manuscript;

JCH—drafting the manuscript, checking and approval of article searched and data extraction; RPB drafting the manuscript, checking and approval of article searched and data extraction;

RRN—drafting the manuscript, checking and approval of article searched and data extraction;

YSM—drafting the manuscript, checking and approval of article searched and data extraction;

CJG—drafting the manuscript, checking and approval of article searched and data extraction; and

All authors read, contributed and improved all versions of the manuscript including approval of the final version for publication.

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sarily reflect the views of the organizations with which the authors are affiliated.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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