

Original Article

# Assessment of Infection Prevention and Control Program in Misurata Medical Center Using the WHO Infection Prevention and Control Assessment Framework (IPCAF), 2023.

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## ABSTRACT

Globally, about 5–15% of patients admitted to hospitals get HAIs and the primary cause for this is poor infection prevention and control (IPC) practices in the hospitals. HAIs continue to be one of the most common adverse events in health care, Despite the developments in infection control measures, HAIs play crucial role in occurrence of antimicrobial resistance. This study aims to evaluate the IPC compliance at Misurata Medical Center (MMC), using the WHO IPCAF tool. A hospital based cross sectional study conducted in The Central Misurata Center in August 2023, data was collected using IPCAF tool form WHO by interviewing the IPC specialist in the center. Responses were scored and interpreted according to WHO guidelines. The total score was calculated to be 607.5 which according to the IPCAF Scoring and Interpretation is an advanced level (601–800), meaning full implementation of the IPC core components according to the WHO recommendations and appropriate to the facility's needs. Structures and processes of Infection prevention and control (IPC) are in general well established in Misurata Central center. Regular assessment of IPC activities is needed and better action plans to improve the IPC activities in the MMC should be adopted.

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على الصعيد العالمي، يصاب حوالي 5-15% من المرضى الذين يتم إدخالهم إلى المستشفيات بعدوى المستشفيات، والسبب الرئيسي لهذا هو ضعف ممارسات الوقاية من العدوى ومكافحتها. تستمر عدوى المستشفيات في كونها واحدة من أكثر الأحداث السلبية شيوعًا في الرعاية الصحية، وعلى الرغم من التطورات في تدابير مكافحة العدوى، فإن عدوى المستشفيات تلعب دورًا هامًا في حدوث مقاومة المضادات الميكروبية. تهدف هذه الدراسة إلى تقييم الامتثال لممارسات الوقاية من العدوى ومكافحتها في مركز مصراتة الطبي (MMC)، باستخدام أداة IPCAF التابعة لمنظمة الصحة العالمية. دراسة مقطعية أجريت في مركز مصراتة المركزي في أغسطس 2023، تم جمع البيانات باستخدام أداة IPCAF من منظمة الصحة العالمية من خلال مقابلة أخصائي الوقاية من العدوى في المركز. تم تسجيل الإجابات وتفسيرها وفقًا لإرشادات منظمة الصحة العالمية. تم حساب النتيجة الإجمالية لتكون 612.5، والتي وفقًا لتفسير وتسجيل IPCAF تعتبر مستوى متقدمًا (601-800)، مما يعني التنفيذ الكامل لمكونات الوقاية من العدوى الأساسية وفقًا لتوصيات منظمة الصحة العالمية وبما يتناسب مع احتياجات المؤسسة. الهياكل والعمليات الخاصة بمكافحة العدوى والوقاية منها (IPC) متأسسة بشكل عام في مركز مصراتة المركزي. هناك حاجة لتقييم منتظم لأنشطة الوقاية من العدوى واعتماد خطط عمل أفضل لتحسين أنشطة الوقاية من العدوى في مركز مصراتة الطبي.

## INTRODUCTION

Healthcare-associated infection (HAI) and infection prevention and control (IPC) have emerged together as the foremost significant public health issues worldwide (1). Healthcare-associated infections (HAIs) are those infections a patient acquires in a hospital or other healthcare facility, during the process of medical care, and not present or incubating at the time of the patient's admission. This includes infections acquired in the health facility, but manifests after the patient's discharge, they also include occupational infections that occur among healthcare workers (1). Globally, about 5–15% of patients admitted to hospitals get HAIs and the primary cause for this is inadequate infection prevention and control (IPC) practices (1). HAIs continue to be one of the most common adverse events in health care, Despite the developments in infection control measures, HAIs play crucial role in occurrence of antimicrobial resistance and related mortality (2-7). The frequency of HAIs is estimated to be more than double in low-income and middle-income countries (LMICs) compared to high-income countries (8). Only 5–7% of patients in high-income countries acquire HAI, and upto 16% in LMICs, reflecting the differences in compliance with the recommended IPC practices (9). A high proportion of HAIs is preventable by adopting simple and effective IPC measures, such as hand hygiene and the use of personal, protective equipment (10-13). For effective implementation of IPC measures, knowledge and understanding of health workers with the right attitude toward IPC is very important (14). Furthermore, about 63.5% of infections caused by antibiotic-resistant bacteria (AMR) are estimated to be healthcare-related (7). Therefore, HAIs prevention is a priority to decrease AMR, which so-called "silent

pandemic" (15). Due to the fact that they constitute a significant burden on the country's economy, (IPC) measures and programs of antimicrobial stewardship (AMS) are more important for countries with limited resources (15). Since 2016, the World Health Organization (WHO) recommended IPC teams and in-facility IPC programs as one of the core components of IPC (2) and its significance was highlighted again in 2021 by the coronavirus disease IPC guidance (16). To help healthcare facilities evaluate certain IPC processes and structures, The (WHO) offers a variety of guideline documents and tools (17-20). In 2018, the WHO released the Prevention and Control Assessment Framework (IPCAF) as a tool can address the entire complexity of IPC measures and not only certain aspects. (21).

A global survey launched by (WHO) in 2019, when Healthcare facilities were encouraged to complete an IPC Assessment Framework (IPCAF) to assess the level of IPC program compliance around the world (22). (IPCAF) is a systematic IPC self-assessment tool, composed of eight IPC core components, that can document progress over time and facilitate IPC progress through repeated administration (21). In Libya, there is a growing awareness of the infection prevention and control importance (IPC). Although there is a national guideline for IPC released by the Ministry of Health. However, there are still challenges to implementing effective IPC programs in hospitals. These challenges include a lack of resources, Lack of awareness, and Inadequate infrastructure. To date, there is no available information on the implementation of IPC programs in Libya, level of IPC compliance, strengths, and weaknesses. The IPC assessment by WHO tool has never been conducted at Misurata Medical Center (MMC), which is a teaching center and the only acute care health

facility in the city. In this report, the (IPCAF) tool is applied to the (MMC) to assess the level of health facility compliance with recommended IPC measures.

**METHOD**

**Study design and setting:**

A cross sectional study conducted in The Central Misurata Center (MMC), the only health facility in the city that provides accident and emergency services.

**Data collection tool – IPCAF**

Data was collected by interviewing the IPC specialists in the IPC department of Misurata Medical Centre in August 2023. The used tool was the IPCAF by WHO (appendix (1)), a structured, closed-ended questionnaire with an associated scoring system. An established tool to measure IPC activities and identify relevant strengths and weaknesses at acute healthcare facilities (6). It comprises eight sections highlighting the eight IPC core components (CC). The results of each question are aggregated, the possible scores ranging from 0 to 100 for each core components. The overall IPCAF score was obtained by summing the findings of all eight core components. The eight CCs of the IPCAF questionnaire are as follows:

- CC1: IPC program
- CC2: IPC guidelines
- CC3: IPC education and training
- CC4: HAI surveillance
- CC5: Multi-modal strategies for implementation of IPC interventions
- CC6: Monitoring/audit of IPC practices and feedback
- CC7: Workload, staffing, and bed occupancy
- CC8: Built environment, materials, and equipment for IPC at the facility level

The tool core components include a total of 81 indicators.

**Data interpretation:**

Step 1: The subtotal scores were calculated for each core component, and then the final total score calculated.

Step 2: The healthcare facility was categorized based on the overall score obtained. (Table 1).

**Ethical consideration**

Approval is obtained by the IPC department manager to apply the IPCAF tool in the department and to use and publish the assessment results.

*Table 1. IPCAF Scoring and Interpretation*

IPCAF Score	Category	Interpretation
0–200	Inadequate	IPC core components implementation is deficient. Significant improvement is required
201–400	Basic	Some aspects of the IPC core components are in place, but not sufficiently implemented. Further improvement is required
401–600	Intermediate	Most aspects of the IPC core components are appropriately implemented. The facility should continue to improve the scope, and quality of implementation and focus on the development of long-term plans to sustain and promote the existing IPC program activities
601–800	Advanced	The IPC core components are fully implemented according to the WHO recommendations and appropriate to the facility's needs

**RESULTS**

Subtotal scores for the eight components were calculated and the scores are presented in table (2).

The final total score was calculated to be 612.5 which according to the IPCAF Scoring and Interpretation (table (1)) is an advanced level (601-800), meaning the IPC core components are fully implemented according to the WHO recommendations and appropriate to the facility's needs.

**Table 2. Calculation of subtotal scores and final total score of core components.**

Section (Core Component)	Subtotals
CC1: IPC program	95
CC2: IPC guidelines	97.5
CC3: IPC education and training	70
CC4: HAI surveillance	40
CC5: Multi-modal strategies for implementation of IPC interventions	70
CC6: Monitoring/audit of IPC practices and feedback	77.5
CC7: Workload, staffing, and bed occupancy	80
CC8: Built environment, materials, and equipment for IPC at the facility level	82.5
Final total score	612.5

Differences were found in the scores of the individual components. (CC1) IPC program and (CC2) IPC guidelines where the two components got the highest scores, 95 and 97.5 respectively. While the lowest score 40 was for (CC4) HAI surveillance. Component-based analysis: as shown in tables (3-10).

**Table 3. Strengths and Gaps of CC1**

Strengths	Gaps
<ul style="list-style-type: none"> <li>· IPC program with clearly defined objectives and an annual activity plan.</li> <li>· IPC team of IPC professionals.</li> <li>· IPC team (doctors, nurses &amp; paramedical) with dedicated time for IPC activities.</li> <li>· The team is supported by the IPC committee includes professional groups such as Senior facility leadership, Senior clinical staff and Facility management.</li> <li>· Measurable outcome indicators and future targets.</li> <li>· Facility leadership clear commitment by an allocated budget.</li> <li>· Microbiological laboratory support, timely and of sufficient quality.</li> </ul>	<ul style="list-style-type: none"> <li>· Full-time IPC professional is not available for ≤ 250 beds.</li> </ul>

**Table 4. Strengths and Gaps of CC2**

Strengths	Gaps
<ul style="list-style-type: none"> <li>· Expertise in both IPC and infectious diseases to develop or adapt guidelines</li> <li>· Available guidelines for (Hand hygiene, Transmission based precautions, Outbreak management and preparedness, Prevention of surgical site infection, Prevention of vascular catheter-associated bloodstream infections, Prevention of hospital-acquired pneumonia, Prevention of catheter-associated urinary tract infections, Prevention of transmission of multidrug-resistant (MDR) pathogens, Disinfection and sterilization, Health care worker protection and safety, Injection safety and Waste management</li> <li>· The adopted guidelines are consistent with national and international guidelines</li> <li>· Implementation of the guidelines is adapted according to the local needs and resources</li> <li>· IPC personnel, frontline healthcare workers are involved in both planning and executing the IPC guidelines</li> <li>· Relevant stakeholders involved in the development and adaptation of IPC guidelines               <ul style="list-style-type: none"> <li>· Specific training related to new or updated IPC guidelines</li> <li>· Regular monitoring of the implementation of the IPC guidelines</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>· Lack guidelines for antibiotic stewardship</li> </ul>

**Table 5. Strengths and Gaps of CC3**

Strengths	Gaps
<ul style="list-style-type: none"> <li>· IPC expertise is leading IPC training</li> <li>· Additional non-IPC personnel with adequate skills to serve as trainers and mentors</li> <li>· Training includes written information, oral instruction and interactive training sessions</li> <li>· IPC training is integrated into the clinical practice and training of other specialities in all disciplines</li> <li>· Ongoing education and development are offered for IPC staff</li> </ul>	<ul style="list-style-type: none"> <li>· Training of healthcare employees is not mandatory</li> <li>· No specific IPC training for patients or family members</li> <li>· No periodic evaluation of the effectiveness of training Programs</li> <li>· Training of cleaners is only for new employees</li> </ul>

**Table 6. Strengths and Gaps of CC4**

Strengths	Gaps
<ul style="list-style-type: none"> <li>· Surveillance is a defined component of IPC program</li> <li>· Professionals are responsible for surveillance activities               <ul style="list-style-type: none"> <li>· The targeted HAIs have been determined by aprioritization exercise.</li> <li>· Surveillance for Local priority epidemic-prone infections, Infections in vulnerable populations, health care workers Infections</li> </ul> </li> <li>· Supported by an adequate microbiology and laboratory capacity</li> </ul>	<ul style="list-style-type: none"> <li>· No informatics/IT support</li> <li>· No surveillance for Surgical site infections, device-associated infections, clinically defined infections, Colonization or infections caused by multidrug-resistant pathogens               <ul style="list-style-type: none"> <li>· No regular evaluation surveillance activities</li> </ul> </li> <li>· No reliable surveillance case definitions, standardized data collection methods, or processes for regular review of data quality</li> <li>· Surveillance data is not used to make tailored unit/facility-based plans for the improvement of IPC practices</li> <li>· Only IPC committee receive feedback on up-to-date surveillance information</li> <li>· No regular analysis of antimicrobial drug resistance</li> </ul>

**Table 7. Strengths and Gaps of CC5**

Strengths	Gaps
<ul style="list-style-type: none"> <li>· Use multimodal strategies to implement IPC interventions</li> <li>· Written information, oral instruction and interactive training included               <ul style="list-style-type: none"> <li>· Monitoring compliance</li> </ul> </li> <li>· Reminders, posters, and awareness-raising tools and initiatives to promote the intervention               <ul style="list-style-type: none"> <li>· Teams and individuals are empowered so that they perceive ownership of the intervention</li> </ul> </li> <li>· Multidisciplinary team implement IPC multimodal strategies</li> <li>· Regularly link to colleagues from quality improvement and patient safety</li> </ul>	<ul style="list-style-type: none"> <li>· System changes not addressing ergonomics and accessibility               <ul style="list-style-type: none"> <li>· No timely feedback on monitoring results</li> <li>· Bundles and checklists are not included</li> </ul> </li> </ul>

**Table 8. Strengths and Gaps of CC6**

Strengths	Gaps
<ul style="list-style-type: none"> <li>· Trained personnel responsible for monitoring/audit of IPC practices and feedback with well-defined monitoring plan with clear goals, targets and activities</li> <li>· Monitoring of Hand hygiene compliance, Intravascular catheter insertion and care, Wound dressing change, Cleaning of the ward environment, Disinfection and sterilization of medical equipment, usage of alcohol-based hand rub or soap, usage of antimicrobial agents and Waste management.               <ul style="list-style-type: none"> <li>· Reporting of monitoring data regularly</li> </ul> </li> <li>· Monitoring and feedback are performed in a “blame-free” institutional culture</li> </ul>	<ul style="list-style-type: none"> <li>· No monitoring of Transmission-based precautions and isolation to prevent the spread of multidrug resistant organisms no regular schedule for undertaking of WHO Hand Hygiene Self-Assessment Framework Survey</li> <li>· Feedback auditing reports within the IPC team only</li> <li>· No assessment of safety cultural factors</li> </ul>

**Table 9. Strengths and Gaps of CC7**

Strengths	Gaps
<ul style="list-style-type: none"> <li>· A system to act if staffing levels are too low is in place</li> <li>· Design of wards in accordance with international standards regarding bed capacity</li> <li>· Bed occupancy is kept to one patient per bed</li> <li>· No patients placed in beds standing in the corridor</li> <li>· Adequate spacing of &gt; 1 meter between patient beds ensured</li> <li>· A system to assess and respond when adequate bed capacity is exceeded is in place</li> </ul>	<ul style="list-style-type: none"> <li>· No assessment of appropriate staffing levels</li> <li>· Health care workers to patient's ratio is not maintained</li> </ul>

**Table 10. Strengths and Gaps of CC8**

Strengths	Gaps
<ul style="list-style-type: none"> <li>· Sufficient water services at all times and for all uses</li> <li>· Reliable safe drinking water station</li> <li>· Functioning hand hygiene stations</li> <li>· Sufficient and functioning toilets</li> <li>· Sufficient power supply at day and night for all uses</li> <li>· Functioning environmental ventilation for inpatients care</li> <li>· Accessible record of cleaning, signed daily</li> <li>· Appropriate and well-maintained materials for cleaning</li> <li>· PPE at all times and in sufficient quantity for all uses</li> <li>· Functional waste collection containers</li> <li>· Functional and of sufficient capacity incinerator and alternative treatment technology for the treatment of infectious and sharp waste</li> <li>· Sterile supply department functioning reliably for the decontamination and sterilization of medical devices and other items/equipment</li> <li>· Sufficient quantity of reliably sterile and disinfected equipment ready for use</li> </ul>	<ul style="list-style-type: none"> <li>· No single patient rooms or rooms for cohorting patients with similar pathogens</li> <li>· No pit or other disposal method used</li> <li>· No wastewater treatment system</li> </ul>

## DISCUSSION

This assessment represents the first application of the IPCAF tool at the IPC department in Misurata Medical Center (MMC). The primary conclusion derived is that the IPC structures and activities are well-established in the (MMC). According to the data collected by this report, the (MMC) has an advanced level of IPC measures with a calculated total score (of 612.5), Meaning full implementation of the IPC core components according to the WHO recommendations and appropriate to the facility's needs.

This result is similar to that of a national survey conducted in 2018 using the same tool on 736

hospitals in Germany, as the overall median score was 690, corresponding to an advanced level of IPC (23). Application of the IPCAF tool on the Lira University Hospital in Uganda, in 2020 demonstrated that the health facility attained only a basic level with a total score equal to 220. (24) In another study included 11 tertiary care hospitals in Bangladesh in 2020 the overall median IPCAF score for the participating hospitals was 355 meaning achieving only a basic level. (25)

Differences were found regarding the individual component scores. (CC1) IPC program and (CC2) IPC guidelines were the two components with the highest scores, 95 and

97.5 respectively, while the lowest score 40 Was for (CC4) HAI surveillance.

The presence of effective IPC national programs supports the prevention of avoidable infections and saves lives as this leads to reduction of HAI rates by > 30% (22). The development of IPC guidelines, protocols standard operating procedures and related implementation strategies is a key function of national IPC programs. For these two important core components, high subtotal scores equal 95/100 for the first core component which focused on the IPC program and a near-optimal score of 97.5/100 for the second core component Infection prevention and control guidelines are obtained. These scores are even higher than those recorded in the national survey in Germany as the mean subtotal scores for the first and second core components were 85.7 and 95.7 Respectively (23). The median subtotal scores obtained in Bangladesh were 50 for CC1 and 67.5 for CC2. (25) At the level of the Lira University Hospital in Uganda no IPC program was there and the IPC guidelines score was only 12.5(24)

The Score for IPC training and education (CC3) was lower than the previous two core components with a subtotal score of 70/100. This can be improved by applying mandatory training for new employees and regular (at least annually) mandatory IPC training for other personnel working in the facility including cleaners who were used to receiving less training regarding IPC activities compared to other healthcare workers. A higher score was obtained in Dutch hospitals as the mean subtotal score for CC3 was 82.7 (23) and lower scores in Bangladesh (25) which was 30 and in the Lira University Hospital, with a subtotal score equal to 35. (24) HAI and AMR surveillance programs can provide critical information about the incidence and prevalence

of HAIs and AMR in the healthcare facility to identify the problem. It also can assess trends over time, geographically or across high-risk populations, and can detect clusters or outbreaks of importance and therefore take public health actions.

The fourth core component which is about healthcare-associated infection (HAI) surveillance has a low subtotal score of 40/100. A lot of improvement should be conducted to elevate the score of the CC4 in the facility to prevent HAIs. A lower score was obtained in the Uganda study (24) with a score equal to 25. In Bangladesh, the CC4 median score is even lower and surveillance activities scored only 5. (25) In contrast the mean score of the same component in the Dutch study was 88.9. (23)

The main topic of the fifth core component is the Multimodal strategies, a relatively new concept in the infection control Practice. (26) The WHO strongly recommends multimodal strategies as the most effective approach to improving IPC practices (27). The strategy consists usually of five elements (system change, training and education, monitoring and feedback, reminders and communications and culture of safety) integrated to provide a clear direction for the health facility to implement these measures. All five areas should be taken into consideration to avoid failure frequently associated with targeting only one area (i.e., unimodal). For core component 5; the subtotal score is 70/100. A score nearly similar to that in the German hospitals where the CC5 was 71.3. (23) However, the score CC5 is zero at Lira University Hospital in Uganda (24) and 35 in Bangladesh.

The process of monitoring and auditing enables the assessment of the degree to which established standards are being adhered to, objectives are being achieved, activities are being carried out by stipulated requirements,

and the identification of areas that may require enhancement. The subtotal score for CC6 is 77.5/100, which is lower than that obtained in the Dutch study as the mean score for CC6 was 82.7. (23) The MMC score is higher than that of Lira University Hospital, Uganda (24) and Bangladesh (25) acute care health facilities with scores equal to Zero and 45 respectively.

The subtotal score for core component 7; Workload, staffing, and bed occupancy is 80/100. An approximate score was obtained from the Uganda study, where the score was 70 (24) and the Dutch study with a mean score 74.1. (23) but lower score recorded in Bangladesh as the median score was only 40. (25)

The last core component (CC8) assesses the infrastructure, materials, and equipment for optimum IPC practices in a healthcare setting, the subtotal score for the MMC is 82.5/100. Which is lower than Dutch mean score of 96.1 (23) and higher than the Lira university hospital score of 77.5 (24) and Bangladesh median score of 67.5. (25)

This application of the IPCAF tool helped us to assess the current IPC situation and identify areas in need of improvement regarding IPC implementation in the health facility. This assessment can be used to adopt better action plans to improve the IPC activities in the MMC and more compliance with WHO recommendations. Also highlight the priority of increased investment in IPC for more healthcare workers safety.

## CONCLUSION

Infection prevention and control (IPC) structures and processes are in general well established in Misurata Central Center. This can be concluded in particular for IPC programs and IPC guidelines. Conversely, the potential for improvement was discovered especially

concerning the HAIs surveillance for aspects of the organization of surveillance, priorities for surveillance, methods of surveillance and Information analysis and dissemination. Regular assessment of IPC activities is needed and better action plans to improve the IPC activities in the MMC should be adopted.

## Conflict of Interest

There are no financial, personal, or professional conflicts of interest to declare.

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