

## Risk assessment grid, priority gaps and action plans of infection prevention and control at Benghazi Medical Center

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### Abstract

Identifying what could cause injury or illness and taking actions to eliminate the hazard and if it's possible to control the risk is the main job of infection prevention and control team. This research attempts to investigate the risk and the priority gaps and control at Benghazi Medical Center. The methodology used here is using a check list from WHO organization and go through each point in the list while visiting different department at Benghazi Medical Center, aiming to evaluate and assist each department gaps in infection prevention and control (IPC) for different aspects like the infection prevention program, guidelines, education and training, surveillance, monitoring/ audit of IPC practices and feedback, workload staffing and bed occupancy, built environment, material and equipment for IPC at the facility level. Each of the previous points will be dealt with to highlight its results. After going through the research and the checklist the results found that the overall median score of IPC level is 225 which makes the hospital fall under the category of basic.

To conclude, this research, has found gaps in monitoring hand hygiene, intravascular catheter insertion and/or care, wound dressing change, transmission-based precautions and isolation to prevent the spread of multidrug resistant organisms, consumption and usage of alcoholic-based handrub or soap. Consumption and usage of antimicrobial agents. significant of the study. There are more than 100 million patients every year around the world infected with health care associated infection which is due to their long stay in health care facilities that leads to a high morbidity and mortality rate.

**Keywords:** Health Care-associated Infection; World Health Organization; Catheter Urinary Tract Infection; Core Components; Decision; Matrix Risk Assessment; Intensive Care Units; Infection Prevention and Control Assessment Framework

### 1. Introduction

Health care-associated infections (HAIs) occur when patients contract infections while receiving medical care in facilities such as hospitals, surgical centers, renal disease centers, and long-term care facilities (1). These infections typically develop 48 hours or more after admission. In low- and middle-income countries, the World Health Organization (WHO) has identified four common types of HAIs: Surgical Site Infections (SSI), catheter-associated urinary tract infections (CAUTI), central line-associated bloodstream infections (CLABSI), and ventilator-associated pneumonia (VAP). To address these issues, the WHO has published guidelines on Infection Prevention and Control Programmes (2). These guidelines serve as a foundation for healthcare facilities to establish and enhance infection prevention and control activities. At the facility level, the WHO has identified eight core components that address

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various aspects of infection prevention and control, including IPC program, IPC guidelines, – IPC education (CC3) – HAI surveillance (CC4) – Multimodal strategies (CC5) – Monitoring/audit of IPC practices and feedback (CC6) – Workload, staffing and bed occupancy (CC7) – Environments, materials and equipment for IPC (CC8) (3).

By threat assessment and gap control, it's set up that infection could be covered and dropped by using some ways to help those infections. There are further than 100 million cases every time around the world infected with health care associated infection which is due to their long stay in health care installations that leads to a high morbidity and mortality rate (4). The threat assessment matrix is a extensively used tool for assaying, assessing and sitting precedence's in threat operation in numerous fields. Threat assessment is considered a crucial stage in the threat operation process and it has numerous way like relating hazards, assaying and assessing all possible risk (5). Several ways are set up in order to help assessing those risk. A threat matrix system, also called " decision matrix threat assessment( DMRA) pathways ", is an approach which uses a methodical fashion to determine the threat position (5) and to compare different risk and define which risk need to be controlled first. The staff involved in threat assessment are called on to manage different issues related to the choice of the most applicable methodological approach, the assessment of the acceptability of the being control measures, the articulation of threat consequence disciplines, the description of the impact- consequences, the explanation of threat liability scales and the development of a threat matrix ( 5) relating a quality gap is generally the first step in designing a good quality design (6). A quality gap refers to the difference between health care processes or issues observed in practice and those potentially attainable on the base of current professional knowledge. In order to ameliorate quality target or pretensions, the outgrowth process or structure is the end to be changed. A preventative intervention is a specific infection- control practice that has been applied to reduce the prevalence of a HAI. An illustration would be using minimal sterile hedge preventives when fitting a central line. staff training is considered quality enhancement strategy that aims to constrict the quality gap for a group of cases (6). Overall objects for hospitals and other healthcare installations play a critical part in public and original responses to extremities, similar as transmissible complaint pandemics. One of the effects that hospitals should have as infection control forestallment and long standing infection control problem is a companion- line to try to manage problems like anti-microbial resistance, transmissible stages out- break and epidemic preparedness. The aim of this study is to properly demonstrate and evaluate the action plan, risks in (deficiencies, performance, Limitations) and priority gaps in Benghazi Medical Center.

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## 2. Methodology

This research uses a cross-sectional and observation according to the (IPCAF) Infection Prevention and Control Assessment Framework tool. The research was conducted at Benghazi Medical Center, was made in the duration between 13<sup>th</sup> of June to the 4<sup>th</sup> of July 2023. Using a checklist, it was modified to focus on eight core components areas and graded using the World Health Organization IPCAF guidelines (3).

### 2.1. Statistical analysis

All data were entered into a coding sheet and analyzed using SPSS version 22 as described elsewhere (7) . Frequency and percentage were calculated. Chi-square test used to study the relationship between some of the variables.

### 2.2. Ethical consideration

This study began after obtaining approval from the university of Benghazi and obtaining permission from the departments.

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## 3. Result

To properly evaluate this research for infection control and risk assessment at Benghazi Medical Center observation and checklists is used to various departments at the hospital. The following chapter will provide some analysis for the checklist.

### 3.1. Critical Area

Critical areas in Benghazi Medical Center consist of the following departments: surgical / Medical department, neonatal department, sterilization department, emergency department, hematology department and communicable diseases department. After going through the checklist made by the researchers it is found in the first core component (CC1) about programme for Infection Prevention and Control that there are few gaps for the following points:

- The availability of at least one full-time IPC professional was not found.

- No time was dedicated by IPC team or focal person for IPC activities.
- NO IPC Committee actively supporting IPC team.
- There was no budget provided by the leadership supporting IPC programme.
- There was no demonstrated support for the objectives and indicators for IPC programme within the facility.
- The second core component (CC2) in the list was for the guidelines of the IPC it found that:
- there was no prevention of surgical site infection.
- there was no infection of hospital acquired pneumonia (HAP) all types of HAP included expect for Ventilator associated Pneumonia,
- There was no prevention of catheter associated urinary tract infection.
- There was no prevention of transmission of multidrug resistance (MDR) pathogens.
- There was no health care for worker protection and safety.
- No injection safety.
- There was no waste management.
- No antibiotic stewardship.
- There was no monitoring of implementation of at least some of IPC guidelines.
- The third core component (CC3) at the checklist was about IPC education and training. It is found that:
- Health care workers, cleaners and people directly involved in patient care were rarely receive training about IPC.
- There was no periodic evaluation of the effectiveness of training Programmes.
- There was no specific IPC training for family members to minimize the potential for health-associated infections.
- Staff were not regularly offered any development and education.
- The fourth core component (CC4) regarding Surveillance for Health Care-associated infection (HIA) in Benghazi Medical Center were:
- there were no defined components of IPC programme regarding
- There were no personnel responsible for surveillance activates like data managements and trained in basic epidemiology.
- There was no IT support to conduct Surveillance.

There was no surveillance conducted for surgical site infection, device associated infection, colonization or infections caused by multidrug- resistance pathogens, local priority epidemic-prone infection, vulnerable populations like neonate, ICU, and burnt patients and there was no informatics analysis data and dissemination data use, no standardized data collection methods and evaluation.

There was no feedback up to date Surveillance information provided from front-line health-care workers and clinical heads/leaders of the department, committee.

The fifth core component (CC5) was multimodal strategies for implementation of infection prevention control intervention which found that there were no multimodal strategies for IPC intervention.

The sixth core component (CC6) for Monitoring/ audit of IPC practices and feedback the sixth point in the checklist it was found that there were no defined clear goals; even though, there were good mentoring. Also, there were no hand hygiene self-assessment framework survey undertaking, as well there was no reporting or monitoring regularly undertaking.

- The seventh core component (CC7) was workload, staffing and bed occupancy which is found that:
- There was no appropriate staff level to assessed in the facility according to the patience workload.
- There was no system supporting the assess or respond in case of bed capacity is exceeded.

The last core component (CC8) in the checklist is point number eight which was built environment, materials and equipment for IPC at the facility level shows that there were no functioning hand hygiene station and no function environmental ventilation available in-patient care areas. Also, there were no records for surfaces being cleaned. And no waste water treatment system for example septic rank followed by drainage pit.

### 3.2. Non-Critical Area

Non-Critical areas in Benghazi Medical Center consist of the following departments: Accommodation section, out patience clinics, hospital kitchen and hospital laundry. Non-critical areas at Benghazi Medical Center happen to have

the same gaps as in Critical areas in all points in the checklist except for point six which was about monitoring and feedback, the non-critical areas were found to have gaps in monitoring hand hygiene, intravascular catheter insertion and/or care, wound dressing change, transmission-based precautions and isolation to prevent the spread of multidrug resistant organisms, consumption and usage of alcoholic-based hand rub or soap. Consumption and usage of antimicrobial agents.

There were no reported feedbacks on monitoring data undertaking regularly on hand-hygiene compliance data or other process.

### 3.3. Overall Area Evaluation

Comparing critical areas with non-critical areas at Benghazi Medical Center, the common gaps found in both areas are as follows:

- in the first core component (CC1) about programme for Infection Prevention and Control with total score of 20 out of 100 it found that:
- The availability of at least one full-time IPC professional was not found.
- No time was dedicated by IPC team or focal person for IPC activities.
- NO IPC Committee actively supporting IPC team.
- There was no budget provided by the leadership supporting IPC programme.
- There was no demonstrated support for the objectives and indicators for IPC programme within the facility.
- The second core component (CC2) in the list was for the guidelines of the IPC with total of 22.5 out of 100 it found that:
- there was no prevention of surgical site infection.
- there was no infection of hospital acquired pneumonia (HAP) all types of HAP included expect for Ventilator associated Pneumonia,
- There was no prevention of catheter associated urinary tract infection.
- There was no prevention of transmission of multidrug resistance (MDR) pathogens.
- There was no health care for worker protection and safety.
- No injection safety.
- There was no waste management.
- No antibiotic stewardship.
- There was no monitoring of implementation of at least some of IPC guidelines.

The third core component (CC3) in the checklist was about IPC education and training with results of 25 out of 100. It is found that:

- Health care workers, cleaners and people directly involved in patient care were rarely receive training about IPC.
- There was no periodic evaluation of the effectiveness of training Programmes.
- There was no specific IPC training for family members to minimize the potential for health-associated infections.
- Staff were not regularly offered any development and education.
- The fourth core component (CC4) in the checklist about Surveillance for Health Care-associated infection (HIA) in Benghazi Medical Center with results of 10 out of 100 it found that
- There were no defined components of IPC programme regarding Surveillance.
- There were no personnel responsible for surveillance activates like data managements and trained in basic epidemiology.
- There was no IT support to conduct Surveillance.

There was no surveillance conducted for surgical site infection, device associated infection, colonization or infections caused by multidrug- resistance pathogens, local priority epidemic-prone infection, vulnerable populations like neonate, ICU, and burnt patients and there was no informatics analysis data and dissemination data use, no standardized data collection methods and evaluation.

There was no feedback up to date Surveillance information provided from front-line health-care workers and clinical heads/leaders of the department, committee.

The fifth core component (CC5) was multimodal strategies for implementation of infection prevention control intervention with score of 10 out of 100 which found that there were no multimodal strategies for IPC intervention.

The sixth core component (CC6) was For Monitoring/ audit of IPC practices and feedback with score of 27.5 out of 100 was found that there were no defined clear goals; even though, there were good monitoring and feedback, however, some gaps in monitoring hand hygiene, intravascular catheter insertion and/or care, wound dressing change, transmission-based precautions and isolation to prevent the spread of multidrug resistant organisms, consumption and usage of alcoholic-based hand rub or soap. Consumption and usage of antimicrobial agents were found.

There were no reported feedbacks on monitoring data undertaking regularly on hand-hygiene compliance data or other process.

The seventh core component (CC7) was workload, staffing and bed occupancy with a result of 50 out of 100 which is found that:

- There was no appropriate staff level to assessed in the facility according to the patient workload.
- There was no system supporting the assess or respond in case of bed capacity is exceeded.

The last core component (CC8) in the checklist is point number eight which was built environment with a result of 60 out of 100, materials and equipment for IPC at the facility level shows that there were no functioning hand hygiene station and no function environmental ventilation available in-patient care areas. Also, there were no records for surfaces being cleaned. And no waste water treatment system for example septic tank followed by drainage pit.

**Table 1** Distribution of results of the total IPCAF score and scores per core component

| Component | Score |      |     |     |     |    |     |     |     |     |     |     |     |     |     |     |     |      |      |
|-----------|-------|------|-----|-----|-----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
|           | Q1    | Q2   | Q3  | Q4  | Q5  | Q6 | Q7  | Q8  | Q9  | Q10 | Q11 | Q12 | Q13 | Q14 | Q15 | Q16 | Q17 | Mean |      |
| CC1       | 5     | 5    | 2.5 | 0   | 0   | 0  | 0   | 2.5 | 0   | 5   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    | 20   |
| CC2       | 0     | 12.5 | 0   | 0   | 0   | 0  | 2.5 | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    | 22.5 |
| CC3       | 10    | 10   | 0   | 0   | 0   | 5  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    | 25   |
| CC4       | 0     | 0    | 0   | 0   | 0   | 0  | 0   | 0   | 0   | 5   | 2.5 | 0   | 0   | 0   | 2.5 | 0   | 0   | 0    | 10   |
| CC5       | 0     | 10   | 0   | 0   | 0   | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    | 10   |
| CC6       | 10    | 0    | 10  | 0   | 2.5 | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    | 27.5 |
| CC7       | 0     | 0    | 0   | 15  | 5   | 15 | 15  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    | 50   |
| CC8       | 7.5   | 7.5  | 0   | 7.5 | 5   | 0  | 0   | 2.5 | 7.5 | 7.5 | 2.5 | 0   | 0   | 0   | 5   | 5   | 2.5 | 60   |      |
|           |       |      |     |     |     |    |     |     |     |     |     |     |     |     |     |     |     |      | 225  |

The following is a graph (Figure one) which shows the risk assessment to risk core components which are: IPC program (CC1) – IPC guidelines (CC2) – IPC education (CC3) – HAI surveillance (CC4) – Multimodal strategies (CC5) – Monitoring/audit of IPC practices and feedback (CC6) – Workload, staffing and bed occupancy (CC7) – Environments, materials and equipment for IPC (CC8).

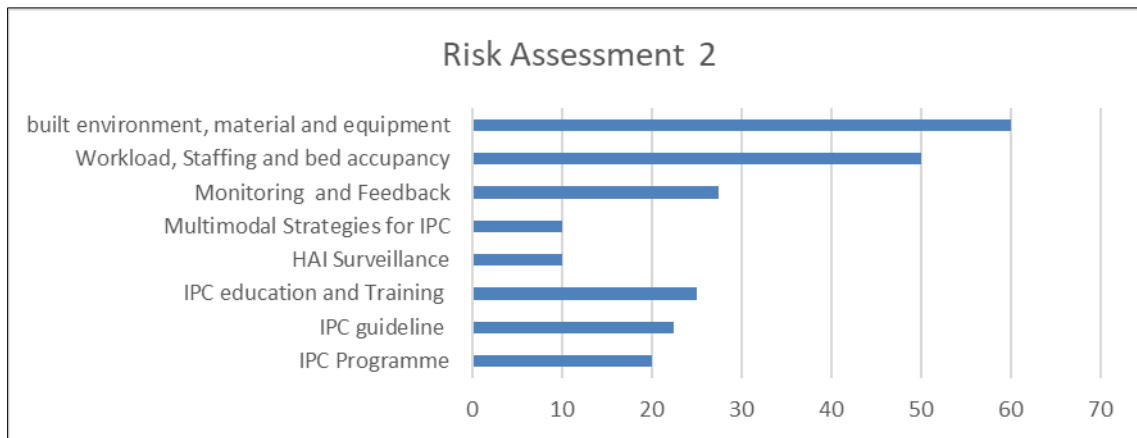


Figure 1 Risk Assessment

Table 2 Risk Assessment

| Risk Assessment                           |      |
|---|------|
| IPC Programme                             | 20   |
| IPC guideline                             | 22.5 |
| IPC education and Training                | 25   |
| HAI Surveillance                          | 10   |
| Multimodal Strategies for IPC             | 10   |
| Monitoring and Feedback                   | 27.5 |
| Workload, Staffing and bed occupancy      | 50   |
| built environment, material and equipment | 60   |

Table 3 Determine the assigned “IPC level” in Benghazi medical center

| Total score (range) | IPC level    |
|---------------------|--------------|
| 0-200               | Inadequate   |
| 201-400             | Basic        |
| 401-600             | Intermediate |
| 601-800             | Advanced     |

#### 4. Discussion

Benghazi Medical Center's score of 225, which ranges from 200 to 400, represents the facility's fundamental IPC level of practice. The findings of this study are presented in the following table (Table 1), which displays the precise outcomes for each item on the checklist. Starting with core component one (CC1), which stands for the IPC program and has a total score of 20 out of 100, there are gaps in the IPC team's composition and there isn't at least one full-time IPC professional. Furthermore, the team was not receiving active assistance from any IPC body.

The second core component (CC2), the IPC guidelines, has a total score of 22.5 out of 100, which indicates gaps in the prevention of urinary tract infections related with catheter use and hospital acquired pneumonia. Prevention of transmission of multidrug resistance pathogens and health care workers and safety, no injection safety, no waste management and no antibiotics stewardship.

The third component (CC3) which was IPC education and training with results of 25 out of 100 shows some gaps in the checklist as follow: there were no frequent healthcare worker training, they rarely receive any, there was no training for the cleaners or other personal directly involved in patient care, there was no periodic evaluation of the effectiveness of training Programmes.

The fourth core component (CC4) which was surveillance with results of 10 out of 100 shows some huge gaps in the checklist as follow: no defied component in the surveillance of the IPC program, no personal responsible for surveillance activities, no IT support what so ever, also, there was no surveillance conducted in surgical site infections or in the device associated infection. As well there was no regular feedback up to data surveillance information.

The fifth core component (CC5) which was IPC multimodal strategy for implementation of IPC with score of 10 out of 100 shows some gaps as follow: there was no multimodal strategy used, and they only depend on posters as a reminder and written information or oral instruction for education and training.

The sixth core component (CC6) which was monitoring, audit of IPC practice and feedback show score of 27.5 out of 100 have some gaps as follow: no monitoring or hand hygiene compliance, also, there was no monitoring inter-vascular catheter insertion and there was no wound dressing monitoring.

The seventh core component (CC7) which was workload, staffing and bed occupancy with a result of 50 out of 100 have some gaps as follow: there was no appropriate staffing level, assessed in the facility.

The eighth core component (CC 8) which was built environment, Materials and equipment with a result of 60 out of 100 shows some gaps in functioning hand hygiene station and also, a gap in functioning environment ventilation, and there is no waste water treatment system.

In this study, the obtained results of IPCAF score in Benghazi medical center were also compared with other related studies reported in international literature from other countries of the world (8-11).

The infection prevention and control level of Benghazi medical center is much lower than the infection prevention and control level of, German (10), Eastern China (12), Korea (13), Central and South America (14) , Turkey (17), health care facilities with range scores between 601 to 800 at the Advanced level The IPC core components are fully implemented according to the WHO recommendations and appropriate to the needs of the facility.

The infection prevention and control level of Benghazi medical center is similar to the infection prevention and control in Bangladesh with range scores between 201 to 400 at the Basic level the Some aspects of the IPC core components are in place, but not sufficiently implemented. Further improvement is required,(15).

Infection prevention and control in Ghana 56 Acute Healthcare Facilities with range from inadequate to advanced(16). 8 facilities scored an IPC preparedness level of "Advance",18 facilities received an "Intermediate" IPC preparedness score, 23 facilities received an IPC preparedness level of "basic" similar to Benghazi medical center level. and 7 facilities scored an IPC preparedness level of "inadequate".

Infection prevention and control in Pakistan 12 health care facilities with a range from inadequate to advanced. (18) One facility fell into the "inadequate" category with a score of 172.5 IPC core components implementation is deficient. Significant improvement is required. lower than level of Benghazi medical center. 5 facilities achieved "basic" category similar to BMC.

And 5 facilities being "intermediate level" with range score between 401 to 600 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 further promote the existing IPC program activities and only one hospital achieved "advanced" status.

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## 5. Conclusion

In conclusion, according to the checklist analysis it is found that Benghazi Medical Center falls at the category of Basic under the score of 225 according to IPCAF assessment frame work tool. the deliverables of the programs are less clear given the lack of defend objectives and annual activity plans. IPC guidelines antibiotic stewardship guidelines not found in hospital which might be a contributing factor to physicians lack of knowledge towards rational prescribing of

antibiotics. training and education were less frequent and sometimes absent, HAI surveillance was found to be routinely lacking, stemming from inadequate microbiology and lab capacity, lack of IT support, and absence of experts trained in basic epidemiology. HAI surveillance cannot be effectively conducted if each of these parameters is not in place. A well-defend monitoring plan with proper goals, targets, and activities was absent in all hospital. Data showed that the hospitals water, electricity, light, and ventilation (Mechanical or natural) system. However, some of the institutions were found to be lacking a sufficient number of functional toilets and hand hygiene stations with regular supplies of soap and hand rub solution and clean single use towels. which is in line with a study's findings on hygiene practices in Benghazi medical center.

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## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

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