

Evaluation of Some Quality Aspects in Pediatric Intensive Care Services at Benha University Hospital

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Abstract: Objective: This study was conducted to evaluate the quality practice of some aspects of pediatric intensive care services in Benha University Hospital through systematic surveillance approach for situation and gap analysis at PICU. **Methods:** The surveillance procedures were based on observational scoring meeting with staff and data collection by questionnaires. The surveillance activities were repeated for 9 times (from November, 2009 to March, 2010) for assurance of accuracy of collected data. **Results:** In the current study the overall assessment of infection control standards in all surveillance cycles (nine cycles) revealed that 6 audits were interpreted as "moderate compliance" (66.7%) and 3 audits were interpreted as low compliance (33.3%). As regards total sterilization standards, surveillances revealed, moderate compliance was achieved in 6 audits (66.7%) and high compliance was achieved in 3 audits (33.3%). The repeated nine audits were interpreted for personnel and structure as having moderate compliance (100%). The current study assessment of mechanical ventilation standards revealed variation through different audits that could be summarized as follows; high compliance of 6 audits (66.7%) and moderate compliance of 3 audits (33.3%). **Conclusion:** There are variable degrees of compliance with the national and international standards of infection control, sterilization and personnel and mechanical ventilation in Benha University Hospital PICU.

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Key words: Quality Aspects, Intensive Care Services, systematic surveillance, mechanical ventilation.

1. Introduction

Pediatric critical care medicine is unique because of the heterogeneity of critically ill patients based on age, diagnoses and treatment modalities, including type and dosing range of medications. The same factors, combined with the complexity of pediatric intensive care unit (PICU) healthcare processes, result in a system that is potentially dangerous. Thus, identification of both real and potential sources of harm to patients or of poor care quality is crucial to ensuring safe care in PICUs. The required system for PICU must describe some specific quality and safety metrics that may be of value to pediatric critical care providers and their administrative counterparts (Forest et al., 2003).

In our current clinical application in PICU at Benha University Hospital we are aware about some quality aspects like definition of quality of care and its indicators. Quality of care can be defined as 'the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge (Lohr, 1990).

Quality indicators are quantitative measures that can be used to monitor and evaluate the quality of important governance, management,

clinical, and support functions that affect patient outcomes (JCAHO, 1989).

The use of performance improvement tools as well as indicators for performance and outcome measurement allow the quality of care and services to be measured. Quality indicators provide a measure of quality of structure, process, and outcome of care (Skews et al., 2000).

Structure can be defined as the way we organize care. Structurally, ICUs are quite heterogeneous, even within regions or countries. The main differences are how the ICU is integrated into the hospital or health care system, the ICU size, the type and amount of technologies available, and the number, roles and responsibilities of its staff (Pronovost et al., 2002).

Process is used to indicate what we do, or we fail to do, for patients and their families during their stay in the ICU. A great number of processes are normally involved in ICU patient care ranging from individual care to general procedures such as admission and discharge and maintenance of equipments (Stucke et al., 2007).

Outcome is defined as changes in the state of health of a patient that can be attributed to an intervention or to the absence of an intervention (Donabedian, 2003).

All the previous definitions are included in the clinical system applied in PICU, to insure quality of service production. The system and system management are a challenge in Benha university hospital, for more than one reason. Some are related to resources, others related to resistance of change and some are related to the system itself. The national health care standards are now available and it is to be implemented for all health care sections in Egypt. These standards must be communicated properly to all health care provider national wide and the compliance will be soon the only way of accreditation.

2. The purpose of this study is to:

- 1- Evaluate level of pediatric intensive care in comparison to the national and international standards as regards structure, ventilator process and infection control process .
- 2- Evaluate potential measures of quality based on availability , safety , appropriateness, effectiveness, and the strength of evidence to support each measure and to categorize these measures as structure, process, and outcome.
- 3- Evaluation of the degree of compliance to national standards concerning PICU.

This allows self evaluation of our PICUs practice and facilities looking forward to better performance.

3. Patient and methods:

Patients:The study include all patients admitted to the PICU Benha university hospital through the period of the study (from November, 2009 to March, 2010).

[I] Standard assessment and classification in PICU:

Both national and international standards of health care production are tabulated in an evaluation format regarding to unit structure and personnel, infection control, sterilization and mechanical ventilation processes.

The national standards are those generated by Egyptian MOH consultatory board in May, 2005 for accreditation of health care organization on national scale. The selected international standards are those related to structural and personnel application (David et al ., 2004), and those related to mechanical ventilation (Sean et al ., 2002). The selection was based on its critical clinical outcome impact of those standards.

Code key: **IC** = Infection control (includes 26 standards), **ST** = Sterilization (includes 16 standards), **CU**=Intensive care(structure and personnel) (includes 68 standards), and **MV** = mechanical ventilation (includes 25 standards).

Standards statement:

We used these terms for assessment: **M** = met: all steps are performed, **P** = partially met: one step or more failed. **N** = not met: all steps are not performed, and **NA** = not applicable.

[II] Group auditing:

Audit is defined as the systematic and critical analysis of the quality of clinical care. This includes unit structure and the procedures used for diagnosis and treatment.

Auditing and surveillance activities were done for all available groups.

(A) All standards were audited over the different shifts of the day:

2 pm – 8 pm. (PM), weekend.
(AM,PM), 8 am – 2 pm. (AM),and 8 pm – 8 am. (Night).

This is adding to the personel observation of the research team and to the outcome of conversation with staff.

(B) Frequency of auditing for each shift:

2 pm – 8 pm. (PM): 3 audits, weekend.
(AM,PM): 1 audit.

8 am – 2 pm. (AM) : 2 audits, and 8 pm – 8 am. (Night): 3 audits

The auditing / surveillance duration is that of the shift time

[III] Data analysis:

For quantification of problem and proper measurement of good and bad practices.

Compliance of standards of each group, compliance of each group collectively, and compliance of all groups collectively.

Compliance was measured as low, moderate, and high compliance.

In our study we considered M = 2 , P = 1 , N = 0.

Compliance of standards of each group:

Each standard was audited 9 times.so the maximum score = $9 \times 2 = 18$.

We considered: Score 0 - 6 = low compliance, Score 7- 12 = moderate compliance, and Score > 13 = high compliace.

By the same way (according to the No of standards) we calculated the compliance of each group collectively and compliance of all groups collectively.

Statistical design: Collected data were tabulated and analyzed using suitable statistical techniques. Frequency distribution tables, Pie charts and bar charts were used.

4. Results:

Our study evaluates some aspects in Pediatrics Intensive Care Unit through 9 audits at different shifts, times, and staff. Each audit takes a time of 2 to 3 days and each audit was re-conducted within 2 weeks interval.

The preliminary instrument included 135 variable standards and this was the questionnaire that was used during the field test (November 2009 to March 2010).

Our result revealed that:

Table (1):Frequency distribution of infection control, structure & personnel, and mechanical ventilation process compliance: NB: * international standards, No: number, %: percent

Standard code	Standard statement	M		P		N		NA	
		No	%	No	%	No	%	No	%
Infection control:									
IC.1	PICU has an active program to reduce the risks of nosocomial infections			8	88.9	1	11.1		
IC.1.1	The program covers patients, staff, and visitors			8	88.9	1	11.1		
IC.2	PICU has established a functioning infection control committee.			2	22.2	7	77.8		
IC.3	A qualified physician oversees the infection control activities			1	11.1	8	88.9		
IC.4	A qualified nurse (at least one) assists in infection control activities			2	22.2	7	77.8		
IC.5	PICU has identified those procedures and processes associated with increased risk of infection. At a minimum, these include the following (when relevant to the hospital's services):								
IC.5.1	Respiratory tract infections associated with intubation, ventilator support , or tracheostomy	8	88.9	1	11.1				
IC.5.2	Urinary tract infections associated with catheters.	8	88.9	1	11.1				
IC.5.3	Blood stream infections associated with intravascular devices.	8	88.9	1	11.1				
IC.5.4	Surgical wound infections	7	77.8	2	22.2				
IC.6	PICU has written infection control policies and procedures . The policies and procedures are followed and include, but are not limited to, the following:								
IC.6.1	Hand washing.	7	77.8	2	22.2				
IC.6.2	Isolation policy, including the management and reporting of patients with suspected communicable diseases					9	100		
IC.6.3	Management of patients who are immunocompromised	4	44.4			5	55.6		
IC.6.4	Prevention of blood-borne infections among PICU staff, including disposal of sharps	5	55.6	4	44.4				
IC.6.5	Prevention of surgical sites infection							9	100
IC.6.6	Prevention of hospital-acquired respiratory tract infections	4	44.4	3	33.3	2	22.2		

IC.6.7	Selection and uses of antiseptics and disinfectant	6	66.7	3	33.3				
IC.6.8	Infection control surveillance and data collection			1	11.1	8	88.9		
IC.6.9	Management of outbreaks of infections					9	100		
IC.7	Infection control policies and procedures are disseminated to all concerned departments after being approved by the infection control committee			1	11.1	8	88.9		
IC.8	Infection control policies and procedures are reviewed And updated regularly by the infection control committee (current professional literature)			1	11.1	8	88.9		
IC.9	All relevant staff have been oriented and trained in the applicable infection control policies and procedures as relevant to their position or job			4	44.4	5	55.6		
IC.10	When relevant to the hospital's services, there are special isolation rooms in the hospital, including negative pressure rooms, for isolating infection cases					9	100		
IC.11	There are hand hygiene facilities in each isolation room							9	100
IC.12	The surveillance data of hospital-acquired infections, and the effectiveness of the program, are regularly aggregated and analyzed by the infection control committee					9	100		
IC.12.1	The results are disseminated to senior management to concerned PICU and, when relevant, are utilized by them for improving the quality of care					9	100		
IC.13	All communicable diseases are reported as required by MOHP regulations.	4	44.4			5	55.6		
Sterilization:									
ST.1	PICU has a central sterilization supply department (CSSD) or defined unit	9	100						
ST.1.1	(CSSD) is managed by an individual who is qualified by education and/or training							9	100
ST.2	The functions of cleaning, processing, and sterile storage and distribution are physically separated.	1	11.1	8	88.9				
ST.3	In all areas where instruments are	1	11.1	8	88.9				

	cleaned there must be airflow that prevents cross contamination and prevents contaminated material from exiting the area.								
ST.4	There are means of preventing cross-contamination in the cleaning area	1	11.1	5	55.6	3	33.3		
ST.5	Based on the services provided and the size of the hospital, the sterilization area has at least one functioning autoclave	9	100						
ST.6	Boiling water is not used as a sterilization technique			9	100				
ST.7	Whatever sterilization technique is used (including chemical cleaning/sterilization of scopes),there is documented evidence that complete sterilization has been accomplished	1	11.1	2	22.2	6	66.7		
ST.8	There are specific policies and procedures that are followed for each sterilization technique or device used, including manufacturer's manuals.	4	44.5	2	22.2	3	33.3		
ST.9	There is documented evidence in their human resources file that staff are trained in these procedures.	1	11.1	1	11.1	7	77.8		
ST.10	Policies and procedures have been developed and used for all processes, including the following:								
ST.10.1	Receiving, disinfection, and cleaning of used items	8	88.9	1	11.1				
ST.10.2	Preparation and processing of sterile packs	8	88.9	1	11.1				
ST.10.3	Appropriate inventory levels	5	55.6	3	33.3	1	11.1		
ST.10.4	Emergency ("flash") sterilization	7	77.8	2	22.2				
ST.10.5	Expiration dates for sterilized items	6	66.7	2	22.2	1	11.1		
ST.10.6	Storage of sterile supplies	5	55.6	3	33.3	1	11.1		
ST.11	Quality control processes and all policies and procedures are uniformly applied in all areas where sterilization is done			7	77.8	2	22.2		
Critical care unit :									
CU.1	The physical location of the intensive care room must support at least the following:								
CU .1.1	Ready access by ambulance, car, or walking	33.3	3	6	66.7				
CU .1.2	Readily identified by signage both within the hospital and from the outside			8	88.9	1	11		
CU .1.3	Entrance and exit without going through other areas of the hospital					9	100		
CU2	Located near:*								

CU .2.1	Elevators			9	100				
CU .2.2	Operating room					9	100		
CU .2.3	Emergency room					9	100		
CU .2.4	Recovery room					9	100		
CU .2.5	Physician on-call room			9	100				
CU .2.6	Nurse manager's office			9	100				
CU .2.7	Waiting room					9	100		
CU .3	*Separate rooms available:								
CU .3.1	Family counseling room					9	100		
CU .3.2	Conference room	9	100						
CU .3.3	Staff locker room	9	100						
CU .4	Physical facility—internal:*								
CU .4.1	Medication station with drug refrigerator and locked narcotics cabinet	9	100						
CU .4.2	Staff toilet	9	100						
CU .4.3	Patient toilet	9	100						
CU .4.4	Hand-washing facility			9	100				
CU .4.5	Clocks					9	100		
CU .4.6	Televisions, radios, toys					9	100		
CU .4.7	Easy, rapid access to head of bed	9	100						
CU .4.8	12 or more electrical outlets per bed					9	100		
CU .4.9	2 or more oxygen outlets per bed					9	100		
CU .4.10	2 or more compressed air outlets per bed					9	100		
CU.4.11	2 vacuum outlets per bed					9	100		
CU .4.12	Heating, ventilation, and air conditioning	9	100						
CU.4.13	Fire safety					9	100		
CU .5	*Space between the beds should be 2.5 - 3 meters (7-9 feet) apart.			9	100				
CU .6	The facility ensures the presence of qualified staff 24 hours a day	4	44.4	5	55.6				
CU .6.1	The hospital has a plan of how to staff the intensive care room			8	88.9	1	11		
CU .7	All intensive care room staff are trained in CPR (cardiopulmonary resuscitation), emergency care, and the use of emergency equipment	9	100						
CU .7.1	*Unit in facility with accredited pediatric residency program					9	100		
CU .7.2	*Unit provides clinical rotation for pediatric residents in pediatric critical care.			9	100				
CU .7.3	*Trained on PALS or advanced pediatric life support					9	100		
CU.8	The record of every patient receiving intensive care includes at least the following:								
CU.8.1	Time of arrival	9	100						
CU.8.2	Conclusions at termination of treatment	9	100						
CU.8.3	Patient's condition at discharge	9	100						
CU.8.4	Follow-up care instructions	9	100						

CU.9	The hospital must have and use clinical guidelines on intensive care. The guidelines must include at least the following:								
CU.9.1	Emergency stabilization and treatment of chest pain	9	100						
CU.9.2	Emergency stabilization and treatment of shock	9	100						
CU.9.3	Emergency stabilization and treatment of polytrauma	9	100						
CU.9.4	Two additional guidelines for the most common diagnoses or presenting complaints	9	100						
CU.9.5	The clinical guidelines must be reviewed at least every two years and updated when indicated by current literature	9	100						
CU.10	Essential emergency equipment, as required by MOHP rules and regulations, is available and in good working order.	4	44.4	5	55.6				
CU.11	EDL medications and lifesaving drugs for emergency care must be available and secure at all times in each emergency room area.	2	22.2	7	77.8				
CU.12	Support diagnostic services are available 24 hours a day					9	100		
CU.13	All hospitals either have an ambulance or have an arrangement for ambulance services	9	100						
CU.14	The hospital ensures that the ambulance service meets the requirements of the MOHP rules and regulations.	9	100						
CU.15	The PICU should have an emergency plan to deal with internal disasters such as the arrival of one or more seriously injured patients. The plan should include the following								
CU.15.1	A list of emergency responsible members, including physicians, nurses, and technicians for laboratory and radiology, and the list is posted in the critical room			5	55.6	4	44		
CU.15.2	The ability of the team to be able to reach the critical room within half an hour.	3	33.3	4	44.5	2	22.2		
CU.15.3	A list of referral centers	8	88.9			1	11.1		
CU.15.4	A plan to mobilize hospital staff and distribute responsibilities among them	1	11.1	6	66.7	2	22.2		
CU.16	PICU has a plan and process for responding to resuscitation emergencies anywhere in the hospital, Includes personnel who will respond ; required emergency lifesaving drugs, including their location,types,			7	77.8	2	22.2		

	and security; and required equipment								
CU.17	Radiology services								
CU.17.1	Ease of access to other services such as X-ray	3	33.3	5	55.6	1	11.1		
CU.17.2	*Portable radiograph	9	100						
CU.17.3	*Computed tomography scan	9	100						
CU.17.4	*Ultrasound	9	100						
CU.17.5	Angiography*					9	100		
CU.17.6	Magnetic resonance imaging*					9	100		
CU.17.7	*Nuclear scanning					9	100		
CU.17.8	*Fluoroscopy					9	100		
CU.18	*Laboratory with microspecimen capability								
CU.18.1	Blood gases Available within 15 min					9	100		
CU.18.2	Complete blood cell, platelet, and differential counts Available within 1 h	9	100						
CU.18.3	Urinalysis Available within 1 h	9	100						
CU.18.4	Clotting studies Available within 1 h	9	100						
CU.18.5	Chemistry profile (electrolytes, serum urea nitrogen, glucose, calcium, and creatinine) Available within 1 h			9	100				
CU.18.6	Bacteriology (culture and Gram-stain) Preparation available 24 h per day	9	100						
CU.19	*Monitoring equipment: Capability of continuous monitoring								
CU.19.1	Electrocardiography, heart rate	9	100						
CU.19.2	Pulse oximetry	9	100						
*Mechanical ventilation:									
MV.1	Central venous catheter infection Prevention of								
MV.1.1	Full barrier precautions	5	55.6	4	44.4				
MV.1.2	No routine replacement of catheters	6	66.7	3	33.3				
MV.2	Ventilator-associated pneumonia Prevention of								
MV.2.1	Gastric decontamination	6	66.7	3	33.3				
MV.2.2	No routine circuit change	7	77.8	2	22.2				
MV.2.3	Avoidance of heated humidifiers and use of heat-moist exchangers	8	88.9			1	11.1		
MV.2.4	Head of bed elevation	9	100						
MV.2.5	Educational program	8	88.9	1	11.1				
MV.2.6	Multidisciplinary team	1	11.1	6	66.7	2	22.2		
MV.3	Prevention of Vancomycin-resistant enterococci								
MV.3.1	Rectal VRE surveillance			1	11.1	8	88.9		
MV.3.2	Appropriate use of oral and intravenous vancomycin	5	55.6	4	44.4				
MV.3.3	Patient cohorting and equipment isolation	4	44.4			5	55.6		
MV.4	Prevention of Gastrointestinal bleeding								
MV.4.1	Appropriate use of stress ulcer prophylaxis	8	88.9	1	11.1				
MV.5	Mechanical ventilation days								

MV.5.1	Multidisciplinary team	1	11.1	4	44.4	4	44.4		
MV.5.2	Weaning protocols (nursing / respiratory therapist [RN/RT] driven)	6	66.7	2	22.2	1	11.1		
MV.5.3	Daily spontaneous breathing trial	9	100						
MV.5.4	Sedation protocols	7	77.8	2	22.2				
MV.5.5	Computer-directed weaning			2	22.2	7	77.8		
MV.5.6	Appropriate use of sedation, analgesia,	7	77.8	2	22.2				
MV.5.7	Time to enteral feeds	9	100						
MV.6	Prevention of Transfusion-related complications								
MC.6.1	Appropriate transfusion trigger	7	77.8	1	11.1	1	11.1		
MV.6.2	Guideline development	6	66.7	2	22.2	1	11.1		
MV.7	Prevention of Medication errors per ICU day								
MV.7.1	Average number of medications per ICU day	2	22.2	7	77.8				
MV.7.2	Computer decision support			1	11.1	8	88.9		
MV.8	Appropriate use of antibiotics via								
MV.8.1	Computer decision support			1	11.1	8	88.9		
MV.8.2	Guideline development	5	55.6	3	33.3	1	11.1		

From this table infection control standards which are reported as low compliance (IC.2, IC.3, IC.4, IC.6.2, IC.6.8, IC.6.9, IC.7, IC.8, IC.9, IC.10, IC.12, IC.12.1, ST.7, ST.9).

Infection control standards which are reported as moderate compliance (IC.1, IC.1.1, IC.6.3, IC.6.6, IC.13, ST.2, ST.3, ST.4, ST.6, ST.8, ST.11).

Infection control standards which reported as high compliance: (IC.5.1, IC.5.2, IC.5.3, IC.5.4, IC.6.1, IC.6.4, IC.6.7, ST.1, ST.5, ST.10.1, ST.10.2, ST.10.3, ST.10.4, ST.10.6).

Structure and personnel standards which are reported as low compliance (CU.1.3, CU.2.2, CU.2.3, CU.2.4, CU.2.7, CU.3.1, CU.4.5, CU.4.6, CU.4.8, CU.4.9, CU.4.10, CU.4.11, CU.4.13, CU.7.1, CU.7.3, CU.12, CU.15.1, CU.17.5, CU.17.6, CU.17.7, CU.17.8, CU.18.1).

Structure and personnel standards which are reported as moderate compliance (CU.1.1, CU.1.2, CU.2.2, CU.2.5, CU.2.6, CU.4.4,

CU.5, CU.6.1, CU.7.2, CU.11, CU.15.2, CU.15.4, CU.16, CU.17.1, CU.18.5).

Structure and personnel standards which are reported as high compliance (CU.3.2, CU.3.3, CU.4.1, CU.4.2, CU.4.3, CU.4.7, CU.4.12, CU.6, CU.7, CU.8.1, CU.8.2, CU.8.3, CU.8.4, CU.9.1, CU.9.2, CU.9.3, CU.9.4, CU.9.5, CU.10, CU.13, CU.14, CU.15.3, CU.17.2, CU.3, CU.17.4, CU.18.2, CU.18.3, CU.18.4, CU.18.6, CU.19.1, CU.19.2).

Mechanical ventilation standards which are reported as low compliance (MV.3.1, MV.5.1, MV.5.5, MV.7.2, and MV.8.1).

Mechanical ventilation standards are which reported as moderate compliance (MV.2.6, MV.3.3, MV.7.1).

Mechanical ventilation standards which are reported as moderate compliance (MV.1.1, MV.1.2, MV.2.1, MV.2.2, MV.2.3, MV.2.4, MV.2.5, MV.3.2, MV.4.1, MV.5.2, MV.5.3, MV.5.4, MV.5.6, MV.5.7, MC.6.1, MV.6.2, MV.8.2).

There was a variation found in the compliance score regarding different shifts (audits):

At the level of infection control : AM shifts were reported as 50% low compliance and 50% moderate compliance, PM shifts were reported as 100% moderate compliance, Night shifts were reported as 66.6% low compliance and 33.3% moderate compliance, a week end shifts were reported as 100% moderate compliance.

At the level of sterilization: AM shifts were reported as 100% moderate compliance, PM shifts were reported as 33.3% moderate compliance and 66.6% high compliance, Night shifts were reported as 100% moderate compliance, A week-end shifts were reported as 100% high compliance.

At the level of mechanical ventilation: AM shifts were reported as 100% high compliance, PM shifts were reported as 33.3% moderate compliance and 66.7% as high compliance, Night shifts were reported as 66.7% moderate compliance and 33.3% as

high compliance, And week-end shift was reported as 100% high compliance.

5. Discussion:

The systematic approach of assessing the quality of health care services is nearly a world wide accepted principle. The application variability from one place to the other remains a debatable problem either on the national or international level. This renders the presence of reference standards as well as clear auditing and surveillance procedures and accreditation mandatory all the way.

The current study was designed to evaluate PICUs at Benha University Hospitals through the national standards and some international standards of essential clinical impact.

In the current study, the overall assessment of infection control standards in all surveillance cycles (nine cycles) revealed that 6 audits were interpreted as "moderate compliance" (66.7 %) and 3 audits were interpreted as low compliance (33.3 %). As regards total sterilization standards, surveillances revealed, moderate compliance was achieved in 6 audits (66.7%) and high compliance was that achieved in 3 audits (33.3%). This revealed a variability of audits compliance probably due to different shifts and different staffs for each audit. Also we can say that PM shifts and weekend shift were better than AM shifts and night shifts. The explanation may be the over workload for AM and night shift's staff, that may lead to exhaustion and lack of concentration.. But by all the ways the presented findings are annoying, as it carries a degree of variability in performance that, for sure, will interfere with the clinical outcome of patients in PICU.

Although the rate of total infection control and sterilization compliance "66.7%; moderate compliance" may give a good impression about infection control practice in PICU at Benha University Hospital, yet the proper analysis of gained data revealed a critical situation in the practice of infection control (IC) and sterilization (ST) either in procedural or practical aspects. This is clearly demonstrated by the partial compliance of those standards related to the application of infection control program, those related to the integration of the program to cover all personnel in contact with PICU, as well as the standards related to the presence of qualified infection control physician and nurse.

Infection control guidelines are present (MOH); but there is lack of its systematic orientation, learning and application due to the absence of organizational infection control system or integrated program.

There is poor monitoring system either on the level of surveillance or data collection procedures, as

well as lack of management of infections outbreaks according to MOH_national standards (Checko, 2000) .

The repeated nine audits were interpreted for personnel and structure as having moderate compliance (100%). This gives the impression of certain stationary situation that may be related to structure design defect or certain system defect or absence.

The structure design, remain a point of debate, as in spite of the standard compliance yet some details are usually missing in accordance with some multinational standardization law. This was evident in facilities available in physician on-call room, nurse manager's office and hand-washing facility

The current study also could highlights many standards with poor compliance that need certain action plan for rapid remedy journey e.g, lack of room's labels, of many required facilities as clocks, televisions, radios, toys , and incomplete gas service facility, of fire and safety clear protocols and regular training of staff,and lack of some diagnostic facilities e.g. angiography, magnetic resonance imaging, nuclear scanning, fluoroscopy, and blood gases analysis is not available within 15 min (but actually available within 30-45 min).

Regarding personnel, the study declared that there is lack of training of staff including lack of staff with accredited pediatric residency program and absence of training on PALS (advanced pediatric life support).

The overall assessment of mechanical ventilation standards: The current study revealed variation through different audits that could be summarized as follow; high compliance of 6 audits (66.7%) and moderate compliance of 3 audits (33.3%) due to variation of different staff members, shifts, and audits timing.

6. Conclusion:

There are variable degrees of compliance with the national and international standards of infection control, sterilization, personnel and mechanical ventilation process in Benha University Hospital PICU.

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11. ABBREVIATIONS: APLS/PALS: Advanced pediatric live support, EDL: Essential drug list, ICC: Infection control committee, ICU : Intensive care unit, MOHP: Ministry of health and population, PICU: Pediatric intensive care unit, VRE: Vancomycin-resistant enterococci
12. WHO: World health organization.

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