
بسمه تعالی

Health care professionals' knowledge and awareness of the icD-10 coding system for assigning the cause of perinatal deaths in Jordanian hospitals

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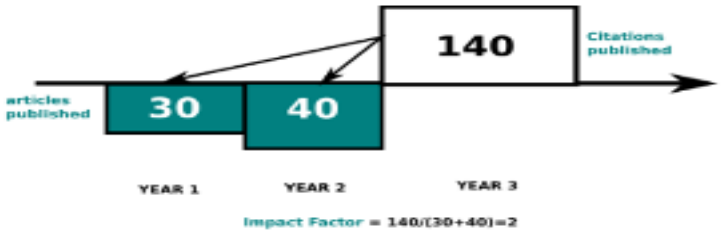
The **impact factor** (IF) 2018 of **Journal of Multidisciplinary Healthcare** is **2.61**, which is computed in 2019 as per it's definition. **Journal of Multidisciplinary Healthcare** IF is **increased** by a factor of **0.65** and approximate percentage change is **33.16%** when compared to preceding year 2017, which shows a **rising** trend. The impact factor (IF), also denoted as Journal impact factor (JIF), of an academic journal is a measure of the yearly average number of citations to recent articles published in that journal.



Journal of Multidisciplinary Healthcare Impact Factor 2019 Prediction

IF 2018 of **Journal of Multidisciplinary Healthcare** is **2.61**. If the same upward trend persists, impact factor of joule may **rise** in 2019 as well.

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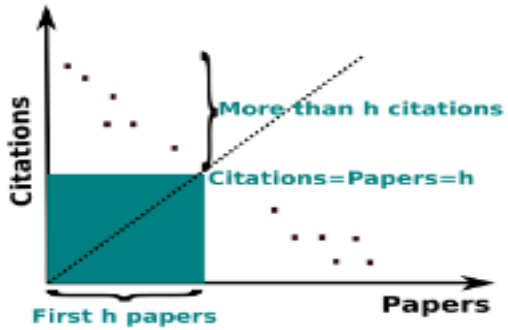
Journal of Multidisciplinary Healthcare h-index



Journal of Multidisciplinary Healthcare has an h-index of **22**. It means **22** articles of this **journal** have more than **22** number of citations. The h-index is a way of measuring the productivity and citation impact of the publications. The h-index is defined as the maximum value of h such that the given journal/author has published h papers that have each been cited at least h number of times.

- **Vital registration data systems** are **necessary** for countries to **identify** and **quantify** health-related issues. These systems provide **accurate**, **complete**, and **timely** vital statistics that can be used to **measure progress toward quality improvement** and **meeting public health goals**.
- **Perinatal and neonatal (PNN) mortality** and its **risk factors** provided by such systems serve as particularly **important socioeconomic** and **health indicators**, thereby influencing **policy development to prevent stillbirths** and **improve research on their interventions** and **high-risk factors.**
- Hence, **accurate** and **timely** registration of births and deaths is an essential feature of **high quality vital registration systems.**

- Despite the usefulness of accurate and well-structured registration systems for reporting PNN deaths and their causes. there is a lack of such systems in low- and middle- income countries, including Jordan.
- Available data on PNN mortality in Jordan come from periodic surveys or from national vital registration statistics. These data do not permit **robust analysis of causes of death** and **associated risk factors** and do not usually include **quality indicators** to help in **planning** and **monitoring PNN services**.

- Another study showed that the death notification form including causes of death is not usually completed by physicians, that physicians are not well trained on how to assign causes of death, and that physicians are often not aware of distinctions between **direct**, **underlying**, and **contributing causes of death**.

- It is clear that Jordan lacks **sufficient credible evidence** for **effective health planning**. Thus, **an electronic surveillance system** that automatically transfers the **data of PNN deaths** and **their causes** to the Ministry of Health (MoH), allowing them to **measure progress in quality improvement**, would be **invaluable for policy makers.**

ICD-10

the standard international classification that is used to report mortality data in order to provide reliable epidemiological information

ICD- PM

. **ICD-perinatal mortality** (ICD- PM) is a new program-based system, which is derived from the ICD-10 and which adheres to the rules and instructions of mortality coding of the ICD-10.

The main aim of this system is to **direct interventions toward decreasing perinatal deaths**

The quality of the register that reports the cause of death is largely influenced by the quality of the information documented in the death certificate

Several factors can affect the quality of documentation

- **reliability and accuracy of diagnostic procedures**
- **the precision taken in documenting the death**

Unfortunately, to date, there is a lack of **consistency** and **accuracy** in the **documentation of the cause of death**, especially in the **absence of international standards**. Particularly in low- and middle-income countries, documentation and reporting of perinatal deaths is inadequate, and research conducted in such countries revealed a failure in adequate examination of the causes of perinatal deaths, especially in regions of high perinatal mortality rates.

identifying the underlying causes of perinatal deaths is a difficult task when there are **inadequate resources** and **a lack of clarity at the health care settings** in which the deaths occur.

This is worrisome, especially given that the **majority** of stillbirths occur in the intrapartum stage and about **three quarters** of neonatal deaths can be avoided.

- Another critical factor in the **success** and **effectiveness** of any death registry is the level of health care professionals' (HCPs') **awareness** and **attitudes** toward it
- . Research has shown that there are **negative attitudes** toward the implementation of coding systems by **health care providers** and **coders**, and this, in turn, could make the implementation process harder. **The complexity of coding systems** and **the lack of skilled coders** might affect HCPs' **use** and **compliance** to such systems.
- It has been found that **older physicians** are more reluctant to use electronic health record (EHR) systems, while **younger doctors** and **doctors who work in larger hospitals** are more open to the implementation of such systems.

- Based on the Higher Health Council's recent report "National Strategy for Health Sector in Jordan 2015–2019" the most important challenges facing the health system in Jordan **include lack of credible evidence** for **effective planning** and **decision-making** in the health system

- **The availability of PNN mortality electronic surveillance systems** in Jordan is important for **accountability**, **decision-making**, **planning**, and **development of effective policies** and **strategies for PNN care**.

- In order to build an effective PNN mortality electronic surveillance system that provides necessary data, **it is important to first understand the health professionals' awareness, knowledge, and use of the ICD-10 coding system and the perceived barriers to the implementation of this system.**

Therefore, the current study aimed to **assess health professionals' awareness, knowledge, and use of ICD-10, assess their perceived barriers to the use of ICD-10, and assess their perceptions of electronic perinatal death surveillance systems in general.**

approaches

- **quantitative**
- **qualitative**

Quantitative part

- four major hospitals from different geographical areas in Jordan

descriptive cross-sectional study

84physicians and 218 registered nurses working in pediatric departments

study questionnaire

Section 1 → **HCPs' sociodemographic data**

Section 2 → ▪ **familiarity, awareness, knowledge, use, and barriers to the use of ICD-10**

Section 3 → **three case studies. The case studies aimed at assessing HCPs' skills and abilities in determining the direct and indirect/contributing causes of deaths that are related to the mother and/or fetus or the neonate, according to WHO guidelines**

Qualitative part

focus group discussions

- A total of 16 focus group discussions were conducted between March 2018 and May 2018 in the four major representative hospitals in Jordan

pediatricians, obstetrics and gynecologists, senior residents, registered nurses, and midwives.

An average of 5 HCPs were interviewed in each focus group, with a total of 80 HCPs participating in the 16 focus group discussions. We made sure that each focus group included at least one HCP from a different specialty.

explore deeply the HCPs' experiences, perceptions, and knowledge of coding systems and of the electronic perinatal death surveillance system.

Data collection

- These HCPs were asked to discuss their knowledge and awareness of the ICD-10 coding system and their perceived benefits and challenges of the current electronic medical record in the hospital they worked. the discussions were developed using **open-ended questions** to facilitate a consistent data collection approach during the in-depth group interviews.
- Each group discussion started with a general question about the HCPs' awareness and perceptions of the current reporting and registration process of neonatal deaths and stillbirths, and then proceeded to more detailed questions based on the answers and experiences shared by the participants in order to elicit discussion.
- The interviews were conducted in Arabic, the local language, with some use of English medical terms by the HCPs during the discussion

ethical considerations

Ethical approval was sought and obtained from the Institutional Research Committee of Jordan University of Science and Technology and from the MoH for the qualitative and quantitative parts of the current study. After full clarification of the study aims and ethical considerations, all participants signed the informed consent form.

Data synthesis and analyses

All recorded interviews were transcribed in full verbatim and then checked for accuracy by the project team who attended the group discussions. The whole content thematic analysis process was done in its original Arabic language to conserve the credibility of the findings. Analysis of the transcribed data was undertaken manually through a coding process and the generation of categories and themes

The content thematic analysis approach consisted of a full reading of the whole transcripts by two independent researchers from the project team, followed by highlighting and coding important sentences into different categories several times until themes and subthemes were identified and agreed upon by the two researchers. Translation of themes as well as quotes into English was undertaken after the generation of themes and subthemes. Preliminary analysis was conducted after each interview in order to obtain a general impression of the data, which allowed for early identification of gaps in the interviews that sometime required further clarifications from the HCPs.

84 pediatricians/residents and 218 nurses

Their ages ranged from 17 to 62 years with a mean (SD) of 31.1 (6.5) years

Participants' characteristics

their years of experience ranged from 1 to 35 years with a mean (SD) of 7.6 (6.5) years and a median of 5.0 years.

More than half (53.0%) of the physicians were females and almost all the nurses were females.

Knowledge and use of icD-10

Table 1 HCPs' awareness and knowledge of the ICD-10

	Health professional					
	Pediatrician/ resident (N=84)		Nurse (N=218)		Total (N=302)	
	n	%	n	%	N	%
Knows what ICD-10 stands for	33	39.3	54	24.8	87	28.8
Familiarity with ICD-10						
Familiar	3	3.6	2	0.9	5	1.7
Somewhat familiar	26	31.0	30	13.8	56	18.5
Not familiar	55	65.5	186	85.3	241	79.8
Had used the ICD-10 in the past						
Yes, very well	5	6.0	2	0.9	7	2.3
Yes, with difficulty	14	16.7	8	3.7	22	7.3
Not at all	65	77.4	208	95.4	273	90.4
Had received training on ICD-10	10	11.9	12	5.5	22	7.3
The department use ICD-10 to record causes of perinatal deaths						
No	12	14.3	20	9.2	32	10.6
Yes	13	15.5	16	7.3	29	9.6
Do not know	59	70.2	182	83.5	241	79.8

Abbreviations: HCP, health care professional; ICD-10, International Classification of Diseases, 10th version.

The primary obstacles/barriers to the use of icD-10 by maternities

Table 2 The main obstacles/barriers for the maternities to use ICD-10

	Health professional					
	Pediatrician/resident (N=84)		Nurse (N=218)		Total (N=302)	
	n	%	n	%	N	%
Lack of knowledge about ICD-10	26	31.0	44	20.2	70	23.2
Lack of an electronic system to support ICD-10 use	16	19.0	15	6.9	31	10.3
Lack of time	14	16.7	11	5.0	25	8.3
Lack of staff	9	10.7	13	6.0	22	7.3
Lack of support by the administration	8	9.5	5	2.3	13	4.3
Too many competing priorities	4	4.8	7	3.2	11	3.6
Lack of interest by the staff	7	8.3	2	0.9	9	3.0

Abbreviation: ICD-10, International Classification of Diseases, 10th version.

Neonatal death notification and perceptions of electronic perinatal death registration

- Our results show that only **30.9%** of **the physicians** and **14.0%** of **the nurses** reported that **they had received training on filling the death certificate and assigning the causes of death**.
- About **41.7%** of **the physicians** and **26.1%** of **the nurses did not know who was responsible for the registration and notification of deaths in their hospitals.**
- When they were asked **about the importance of having a new system for the electronic registration of births and neonatal deaths, 86.9%** of **the physicians** and **85.2%** of **the nurses saw that it was important to have such a system**.
- **56%** of **the physicians** and **65.3%** of ***the nurses*** stated that **the workplace policies ensured security and confidentiality of the data.**

assigning causes of neonatal deaths according to icD-10

Table 3 The percentage of health professionals who correctly identified the causes of neonatal deaths

	Pediatrician/ resident (N=84)		Nurse (N=218)		Total (N=302)	
	n	%	n	%	N	%
Case 1						
I. Main disease or condition in newborn that lead to death	43	51.2	131	60.1	174	57.6
II. Other disease or condition in newborn that contributed to death	27	32.1	70	32.1	97	32.1
III. Main maternal disease or condition affecting the newborn	18	21.4	55	25.2	73	24.2
IV. Other maternal disease or condition affecting the newborn	19	22.6	64	29.4	83	27.5
Case 2						
I. Main disease or condition in newborn that lead to death	25	29.8	66	30.3	91	30.1
II. Other disease or condition in newborn that contributed to death	23	27.4	40	18.3	63	20.9
III. Main maternal disease or condition affecting the newborn	16	19.0	32	14.7	48	15.9
IV. Other maternal disease or condition affecting the newborn	11	13.1	26	11.9	37	12.3
Case 3						
I. Main disease or condition in newborn that lead to death	57	67.9	150	68.8	207	68.5
II. Other disease or condition in newborn that contributed to death	–	–	–	–	–	–
III. Main maternal disease or condition affecting the newborn	20	23.8	98	45.0	118	39.1
IV. Other maternal disease or condition affecting the newborn	–	–	–	–	–	–

Knowledge and awareness of the icD-10 coding system

In congruence with the quantitative results, the **majority of HCPs across all the hospitals were not aware of or familiar with the ICD-10 coding system**. Some physicians acknowledged that they never heard about ICD-10.

GD3

"This is the first time I've heard of it […]. I never heard about ICD-10

nurses

I'm familiar with it as I work at the Quality Assurance department and we use the ICD-10 for accreditation purposes […]. However, we (referring to the nurses) are not required to use it […]".

senior pediatrician

"I do not use it. I guess that the residents are the ones who document the cause of death most of the times",

- There were several reasons behind HCPs not using the coding system, as mentioned by several participants. These reasons included **HCPs' unawareness of how the coding system works and its importance, the large amount of clinical work involved, and the time needed to assign the cause of death, which can often be a burden on the doctor**.

- **Additionally, several doctors complained that the coding system is not comprehensive**.

senior resident

"it doesn't always have the exact cause/diagnosis that we identify […] we're forced to write the diagnosis manually or choose the closest diagnosis but not the exact one".

- In **the University Hospital**, doctors said that they had **heard about the ICD-10** but that hey usually **wrote the diagnosis "encounter" manually** and then the **Medical Records department** used the coding system to **match the diagnosis with the appropriate codes**.
- However, most of the interviewed physicians at the University Hospital were concerned that the coders at the Medical Records department **were not trained enough** or **familiar** with the ICD-10 coding system, thus meaning that they may sometimes choose the wrong codes for diagnosis. Another related concern raised by the University Hospital physicians was that the coders **rely on what the doctor writes in his/her notes about the diagnosis**.
- If the doctor writes a wrong diagnosis, then the coders will, therefore, choose a wrong encounter.

pediatrician

"for example, if I diagnose the baby wrong and write it in my discharge notes, the guys at the Medical Records department will insert a wrong code […]".

senior resident

"we try our best to use terminologies that match those found in the ICD-10 […] but not all doctors adhere to these terminologies…this makes it hard for the coders in the Medical Records departments to find the appropriate code for the diagnosis"

In some cases, where the cause of death is "unspecified" in the death certificate completed by the doctor, the coders then choose any encounter randomly, even if it is wrong.

senior pediatrician

"we have tried to train residents on this coding system at least, to decrease the cases of wrong or unspecified diagnoses".

In this sense, a stated, This issue was not shared by the physicians working at the governmental MoH hospitals, as the doctors themselves who write the diagnosis may also use the ICD-10 codes, although the majority of the doctors do not use it.

Perceived problems and challenges with the current electronic patient medical systems

- Lack of adequate training and familiarity with the system, especially for junior staff, as well as high turnover rates of staff and transfer of doctors between hospitals that do not have electronic medical record systems were the main challenges mentioned by HCPs working in the MoH hospitals.

- One critical problem, mentioned by HCPs working at the three MoH hospitals, was the defect in "electronic" communication between hospitals, especially in cases of patient transfer from one hospital to another and despite the fact that the hospitals are connected to the same electronic medical system. On top of that, HCPs complained that the current electronic medical record does not generate statistics about birth rates, death rates, etc

an

"it doesn't produce useful numbers that I can look at and benefit from […] which makes it not efficient and useless".

"it's just not smart enough […]. I mean it's not an intelligent system that saves information […] and it's boring

- ". With regards to the infrastructure, the **majority of HCPs** who use the current patient medical record at the hospitals they work at complained that they have **old computers and printers**, which are **slow** and have **poor access to the internet**.

A doctor at one hospital admitted

"I'd rather see 60 patients in my clinic and provide care for them […] than write any- thing via the electronic medical file as it's such a waste of time and it's old".

- Overall, **there was congruency between both the quantitative results and the qualitative findings which arose from the current study**.
- The majority of HCPs in the four selected hospitals **were not familiar** with the ICD-10 coding system and hence reported **minimal use** of it. Surprisingly, the **majority of HCPs** were not aware of whether or not their department used the ICD-10 to **record perinatal mortality**.
- HCPs identified **lack of knowledge**, **time, staff** and **management support**, and **an effective** and **comprehensive electronic system** that can accurately allow physicians to select **the exact cause of death** as **main barriers** to the **use of the ICD-10**.

- The findings from previous literature are consistent with our findings.
- On one hand, several worries were reported in the literature by doctors on the use of ICD-10, such as the readiness and comprehensiveness level of the software itself, the time and precision needed for documentation, doctors' capacity to learn a new, unfamiliar skill that is relevant to computer software, and lack of training. On the other hand, doctors reported some benefits of implementing the ICD- 10-CM, including effective data statistics. Moreover, also in congruence with our findings, previous literature identified negative attitudes of health care providers and coding professionals toward the implementation of ICD- 10-CM/PCS.
- These negative attitudes were due to a lack of adequate coding professionals and difficulties in dealing with a complex coding system, which can be frustrating for some health care providers.

- Additionally, junior doctors were more open to the use of EHR systems, whereas older doctors were more reluctant to using such systems.

- Regardless, the commitment levels shown by health care providers to the use of the new coding system can predict the success of the implementation process. Moreover, few nurses and physicians in the current study reported having received training on filling out the death certificate and assigning the causes of death electronically in their hospitals. The vast majority of HCPs encouraged the idea of having an electronic registration system to record all perinatal deaths; however, less than half showed intention on using the system to record and register these deaths.

- Surprisingly, one-third of HCPs were not able to identify the correct main cause of death in case study 1, which is still a higher percentage among the other two case studies, yet a smaller number of them were able to identify the contributing causes of death and the maternal conditions linked to the death of the newborn.

- Studies reported that cause of death statistics can permit comparisons within and between countries and can support the development and evaluation of appropriate health interventions However, identifying the underlying cause of perinatal death is complex due to lack of resources and lack of precision at hospitals.15 An improvement in this is critical, **especially given that the majority of perinatal deaths are usually preventable**

- The majority of the HCPs in the current study reported lack of training on how to fill out a death certificate, and they were not sure who was responsible for completing the death certificate electronically.
- The information written on the death certificate is detrimental for accurate registration on the electronic system/software. However, similar to our findings, some HCPs still report more than one underlying cause of death, and this can be a challenge to the prevention of similar future deaths.

- Several factors may lead to the incorrect registration of the cause of death, such as inappropriate documentation of the death certificate by the doctor, personal interpretation of medical terms, complexity of the ICD-10 coding system, and diverse understanding of coding rules.
- Hence, one of the vital factors of improving the accuracy and consistency of the cause of death statistics is the **proper use of the standardized coding system** (ie, ICD-10). Furthermore, implementing a new coding system in hospitals requires periodic and comprehensive training on computer and the coding systems as well as effective management and leadership skills.
- Research has shown that about half of HCPs stated that training was the most important element of the ICD-10-CM/PCS conversion.

- Accurate classification of the causes of perinatal deaths across all settings, using a well-known, internationally recognized system is the fundamental step in selecting and using relevant software and programs.
- Both perinatal and maternal conditions are highly related; hence, aiming at decreasing perinatal mortality could also help in reducing maternal mortality and vice versa. This can be best achieved through developing a system that focuses on the underlying causes and the perinatal and maternal conditions contributing to death simultaneously.

- Although some of the HCPs in our study said that they might not use the electronic death registry once developed, having a standardized program that can accurately identify and document the causes of death, both direct and indirect, has **a great potential to facilitate interpreting the perinatal and maternal data linked to deaths**. The transition to a new coding system will permit health care providers to categorize diseases, improve documentation of diagnosis and any related complications, and monitor and evaluate outcomes related to health care more successfully, especially in rural and disadvantaged regions.

- Accordingly, regular training of HCPs on how to use the ICD-10 is vital during the application of any new health technology system. Therefore, stakeholders and managers of hospitals need to hire and continuously train new coding professionals to implement the system in a quick and sustainable way. For doctors, nurses, and midwives, the transition to ICD-10 requires a change in how patients' medical history and diagnosis are documented. HCPs need to find out how the new coding system will influence their capability to correctly recognize diagnosis and process codes and to be detailed and specific.

Calculating the **rate of stillbirths** and **neonatal deaths** and **collecting the necessary information** about **the direct** and **indirect causes** and **contributing factors of death** enable HCPs and stakeholders to lead the **death review** and **audit process to the prevention of similar future deaths**.

- Finally, the use of a survey could limit the trustworthiness of the study, however, to overcome this limitation, **we used a mixed method design in which we conducted 16 different focus group discussions to ensure credibility of the quantitative part**. Public hospitals in Jordan are relatively new in using the EHRs including the ICD-10, which could have limited the HCPs understanding of the topics being discussed.

- The current findings emphasize the importance of having an **effective** and **comprehensive electronic system** to **accurately report** and **register all perinatal deaths**.
- The system also needs to take into consideration **the direct** and **indirect causes of death** and **the contributing maternal conditions at the time of perinatal death**. Implementing a new coding system in a health care organization requires **adequate awareness sessions** and **periodic training of HCPs on computers** and **the coding system,** as well as **effective management** and **supportive leadership.**

با تشکر از توجه شما

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