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Development and implementation of a medical certificate of cause of death audit system for hospital deaths in Thailand

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Introduction/Motivation

Vital statistics, particularly those relating to data on live births, deaths, and cause of death, provide a good indication of the state of public health, and are useful nationally and locally. Mortality data is an important health indicator for monitoring the development of the Thai public health system. The main source of mortality data is derived from the efficient Civil Registration system. It covers up to 95% of the total population. However, cause-specific mortality information still needs to be examined and improved.

The Strategy and Planning Division of the Ministry of Public Health (MOPH) of Thailand requires all hospitals to record the death certificate (Tor Ror 4/1) through the mortality data reporting system, which is used to determine the underlying cause of death in accordance with the criteria of the World Health Organization.

According to the 2019 Public Health Statistics Report, Thailand had a total of 494,339 deaths, divided into deaths in hospitals and deaths outside hospitals, at 45 percent and 55 percent respectively. Through the death reporting system, we were able to identify the deceased using Identification numbers for 168,787 cases (representing 76 percent of deaths in hospitals). It was found that the cause of death information from the death certificate (Tor Ror 4/1) was still inaccurate from the actual cause of death. If there is a process for verifying death certification in a medical facility, the quality of the cause of death will be more accurate. Therefore, the Strategy and Planning Division has established a project to develop a process for checking the quality of death certificates in hospitals to get information about the true cause of death that can be used to improve the quality of the cause of death data to meet the quality standards of the World Health Organization; and supporting policy decisions for further development of public health work in the country.

Objective

1. To develop guidelines for recording death certificates in hospitals (Tor Ror 4/1) in electronic format.
2. To develop a process for examining the quality of death certificates in hospitals (Tor Ror 4/1) in electronic form.

Methods/Work performed

We have developed and implemented a system with assisting tools and a system for regular review of medical death certificate by auditors' doctors in 11 provinces across the country. The implementation of the project has been developed in two parts:

a) The system for issuing death certificates through the Electronic Medical Death Certificate (eMDC).

It is a modification of the doctor's paper writing to be recorded via the website. The personal information database is linked to the Office of Registration Administration, Department of Provincial Administration, and Ministry of Interior to automatically show personal data such as name, sex, nationality, family information, religious believe etc. Moreover, there are drop-down lists for the diagnosis text and underlying cause of

death to prevent misspelling and disease's rule checking such as ovary cancer can not appear in male. These features are to make use of information and reduce the burden of data recording of relevant staff.

b) Medical Certificates of Cause of Death Audit (MCCD audit) system.

After the medical death certificate were created and issued in electronic format, the auditor will check the quality of every death certificate by searching for more treatment history in Ministry of Health database. If the auditor found the error, they will edit, rates the death certificate, and give feedback the doctor. However, if the auditor found the same mistake in the death certificate, there will be a physician meeting to consult and find solution in the hospital level and provincial level respectively

The results of the reviewed medical deaths certificates can be divided in to 3 categories which are (1) Correct means that all sequence of the diagnosis text were written correctly, and the underlying cause of death were acceptable by the auditor. (2) Minor error means that the information in the medical death certificate was not enough or needed to be added such as change/edit the diagnosis text, add more details about external cause of death or more detail about the supporting cause of death (3) Not correct means wrong conclusion of underlying cause of death or write mode of death instead of underlying cause of death.

As part of this project, we planned to achieve the goal in the following steps:

- Estimates the overall mortality situation in provincial hospital in each region.
- Design Electronic Medical Death Certificate (eMDC) system as well as auditing system in parallel.
- Training physicians to use the Electronic Medical Death Certificate (eMDC) system and review the auditing standard as well as test system in pilot hospital.
- Monitoring implementation in pilot hospital.
- Summarize the result of implement from each province.

The development will be implemented during July 2021 to March 2023 and evaluated for feasibility in scaling up nationwide. During the implemented duration, we divided the scale up plan into 2 phases:

- Phase 1 We initiate by the voluntary provincial hospitals in each region in Thailand. Pilot hospitals were selected by the mortality count within province and that province has an advance-level hospital. The implementation started on July 1, 2020.
- Phase 2 We scale up the project to hospitals in 12th health region sector including six provinces in southern part of Thailand. This implementation phase started on August 1, 2021.

Discussion

Between July 2021 and March 2023, 179 hospitals were using eMDC, and they issued 42,130 electronic death certificates. The percentage of electronic medical death certificates audited in five pilot hospitals in table 1 and 12th health region's provinces in table 2.

Table 1 Percentage of electronic medical death certificates audited in five pilot hospitals in phase 1

Province	Number of electronic medical death certificate issued by eMDC	Number of audited electronic medical death certificate issued by eMDC	Auditing percentage (%)
Chiangrai	6566	5,036	76.7
Ubon ratchathani	8,785	6,006	68.4
Chantaburi	5,044	3,203	63.5
Nakornsawan	8,929	4,411	49.4
Songkla	5,915	3,040	51.4
Total	35,239	21,696	61.6

Data retrieved in March 22,2023

Table 2 Percentage of electronic medical death certificates audited in 12th health region's provinces in phase 2

Province	Number of electronic medical death certificate issued by eMDC	Number of audited electronic medical death certificate issued by eMDC	Auditing percentage (%)
Phatthalung	1,209	1,188	98.3
Trang	1,617	1,454	89.9
Satun	585	418	71.5
Pattani	1,063	538	50.6
Yala	1,133	705	62.2
Narathiwat	1,284	969	75.5
Total	6,891	5,272	76.5

Data retrieved in March 22,2023

As of March 2023, 64% of medical deaths certificates were reviewed. The auditor doctor rated each death certificate as correct, minor error and incorrect, according to the following rules:

- Correct: all sequence of the diagnosis text were written correctly, and the underlying cause of death were acceptable by the auditor.
- Minor error: needed more support information.
- incorrect: wrong conclusion or write only mode of death

The results from the auditor shown below. The percentage of electronic medical death certificates audited in five pilot hospitals in table 3 and 12th health region's provinces in table 4.

As the data show, 42% of these were completely correct, 35% were minor errors, such as switching sequence of the causes of death, mode of death error and 24% were complete error such as have only mode of death with not enough medical details etc.

Table 3 Number and percentage of quality analysing in auditing electronic medical death certificate

Province	Number of audited electronic medical death certificate issued by eMDC	Quality analysis results		
		Correct	Minor errors	Incorrect
Chiangrai	5,036	2,628 (53%)	1,310 (27%)	1,098 (22%)
Ubon ratchathani	6,006	2,613 (44%)	2,262 (38%)	1,131 (19%)
Chantaburi	3,203	1,435 (45%)	792 (25%)	976 (31%)
Nakornsawan	4,411	1,489 (34%)	2,000 (46%)	922 (21%)
Songkla	3,040	852 (29%)	1,635 (54%)	553 (19%)
Total	21,696	9,017 (42%)	7,999 (37%)	4,680 (22%)

Data retrieved in March 22,2023

Table 4 Number and percentage of quality analysing in auditing electronic medical death certificate

Province	Number of audited electronic medical death certificate issued by eMDC	Quality analysis results		
		Correct	Minor errors	Incorrect
Phatthalung	1,188	667 (57%)	303 (26%)	218 (19%)
Trang	1,454	655 (46%)	306 (22%)	493 (34%)
Satun	418	138 (34%)	147 (36%)	133 (32%)
Pattani	538	239 (45%)	130 (25%)	169 (32%)
Yala	705	198 (29%)	264 (38%)	243 (35%)
Narathiwat	969	313 (33%)	244 (26%)	412 (43%)
Total	5,272	22,10 (42%)	1,394 (27%)	1,668 (32%)

Data retrieved in March 22,2023

Conclusion

As we implement this project, we found that electronic medical death certificate system together with the auditing system help improve mortality data and mortality registration system. However, we also found 2 major challenges: (1) miscommunication among healthcare worker and the registrar, so Ministry of Public Health provide a Standard Operating Procedures on Death Certification for Physicians, and (2) a lack of auditor's doctors and workload of auditor's doctors, hence, we additionally provide consulting meeting and developing artificial intelligence (AI) to assist determine the quality of cause of death. A teamwork, networking, setting experience, and policy support were essential to the implementation's success.