



Improving Pandemic Integrated Care Using Digital Technology for Health Care Organization: A Qualitative Study

Tris Eryando^{1✉}, and Sandra Hakiem Afrizal²

¹Faculty of Public Health, Universitas Indonesia, Depok, Indonesia

²Faculty of Health Sciences and Technology, Universitas Binawan, Jakarta, Indonesia

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Abstract

Studies for exploring the pandemic integrated care through the implementation of health information systems using digital technology are very limited. Thus, the research findings provide genuine information regarding the system integration assessment for the regulators and provide an integrated COVID-19 system design sample as a robust solution. The authors evaluated the implementation of the current COVID-19 information system to explore and describe the barriers and challenges from the perspective of the COVID-19 Task Force Team of the South Tangerang District, Indonesia, and to propose an effective design of the COVID-19 functional integrated system. A qualitative form of research was conducted in the South Tangerang District in May 2020. The research informants chosen purposively, work related to the information system from the district health office, health center at the sub-district level, and from the community, which accommodates the adequacy and appropriateness principles. Seven respondents were selected based on their involvement and knowledge of the COVID-19 monitoring and reporting process. Rapid Assessment Procedures (RAP) were used to gather, analyze, and interpret the data. As a result, three (3) themes of barriers were identified as involved in functional integration through the implementation of the COVID-19 information system, namely individual behavior, data governance in the organization, and communication and networks.

Introduction

Integrated system during the pandemic is an essential approach of the health care organization to create a single monitoring system that integrates several data sources, monitors the health indicator, and reports the current health condition on a real-time basis (Farias *et al.*, 2010). The World Health Organization recommends functionally integrated care through an Integrated information system that links all network members with data disaggregated according to relevant indicators (World Health Organization, 2016). The information system for coronavirus disease (COVID-19) pandemic development was introduced worldwide after it was declared on 30 January 2020 as a Public Health Emergency of International Concern (PHEIC)

by the World Health Organization through the website address: <https://covid19.who.int/>. The WHO COVID-19 dashboard elaborates on the current global situation such as confirmed cases, and death cases from country or territory.

Indonesia, with the 4th largest population in the world, was confirmed to have a COVID-19 Pandemic on 11 March 2020, and the pandemic has spread to all provinces in the country. The largest escalation of new cases in the first wave was in May 2020 followed by the second wave which started on May 2021 with more than 50 thousand cases per day and also the highest number of deaths in the South East Asia Region since then (Iuliano *et al.*, 2021; Puno *et al.*, 2020). A review of the epidemiologic data indicated that the number of cases or deaths may be much higher than

✉ Correspondence Address:

Universitas Indonesia, Fakultas Kesehatan Masyarakat, Depok,

West Java, 12345 Indonesia

Email: tris@ui.ac.id

reported (Dhar Chowdhury & Oommen, 2020) an infectious respiratory illness caused by the severe acute respiratory syndrome–corona virus 2 (SARS-CoV2).

The Indonesian government has started to develop a national web-based COVID-19 reporting system to monitor the cases (Setiati & Azwar, 2020) suppress the spread by imposing lockdown on a large scale, improve healthcare service, and increase the availability of personal protective equipments (PPE. A local web-based information system has been launched which can be used by the public to avoid red zones or danger areas exposed to COVID-19 and also to access the statistical data of suspected, confirmed, and death cases (Sevindik *et al.*, 2021). The National Task Force has also developed a new application named *Bersatu Lawan COVID-19* (BLC) or *Together Against COVID-19* and *Pedulilindungi* which is developed by the Ministry of Communication and Information. The applications have the purpose of accelerating the data flow starting from the public primary health carers, hospitals, laboratories, and district health offices and also a vaccination monitoring system (Kurniawati *et al.*, 2020). The apps can determine the distribution of COVID-19 cases, as well as the availability of healthcare facilities such as public primary health carers, referral hospitals, laboratories, and district health offices. Through this application, the public is also able to find out the: high-risk areas, and self-isolation features, and undertake an online consultation with doctors and psychologists.

A quick response during the COVID-19 pandemic requires systems that can directly detect and investigate cases on a real-time basis. The implementation of a Health Information System for COVID-19 in an urban area of Indonesia as the epicenter of the virus, including the South Tangerang District, has to be assessed in terms of constraints or barriers. The application through the integration field of the organization is relatively rare in health studies (Kaehne, 2019) it has now developed into a mature field of scientific inquiry with its own associations and think tanks, special interest groups and dedicated policies focussing on designing and implementing integrated care solutions within and across professional sectors.

It has also spawned an enormous amount of conceptual and empirical research. Despite all the progress, there remains a lingering question at the heart of the discipline. Why do organisations do integrated care? This is not to question personal motives for integrated care. We know that integrated care solutions deliver better conditions for professionals, which ultimately may lead to improved patient care. A recent systematic review indicated that integrated care models demonstrated positive impacts in at least two of the triple aims, access and patient care quality (Baxter *et al.*, 2018). Therefore, an evaluation of the COVID-19 information system is necessary to provide genuine information regarding the functional integrated care of the system.

Studies for exploring health information management for pandemic purposes are very limited. Thus, the objective of this study is to explore the barriers and challenges of functional integrated care implementation during the COVID-19 pandemic and to propose an effective design for integrating COVID-19 care through an information system. The outcome of this study is to encourage the readers, professionals, and scholars to understand the COVID-19 integrated system for contributing to the improvement of COVID-19 management in Indonesia which can be applied by other low-middle-income countries with large populations.

Method

This research was a qualitative study accomplished by conducting in-depth interviews. A qualitative study was chosen to explore the opinions, views, and experiences of individuals through the Rapid Assessment Procedures (RAP) including gathering, analyzing, and interpreting data so that action can be taken as rapidly as possible (Sargeant, 2013) and the term is inconsistently applied. We propose the concept “information power” to guide adequate sample size for qualitative studies. Information power indicates that the more information the sample holds, relevant for the actual study, the lower amount of participants is needed. We suggest that the size of a sample with sufficient information power depends on (a. To further establish the

trustworthiness of the results, we also compare and examine the data by triangulation of the data source to produce a more comprehensive view for confirming the validity of the research.

The research informants chosen purposively, work related to the information system from the district health office, health center at the sub-district level, and from the community, which accommodates the adequacy and appropriateness principles. The study was conducted in the South Tangerang District, Province of Banten, Indonesia in May 2020. Seven respondents were selected based on their involvement and knowledge of the COVID-19 monitoring and reporting process. Selected organizations were from 1) the COVID-19 task force team of the District Health Office (DHO), 2) the COVID-19 task force team of a Public Primary Health Care facility, and 3) the COVID-19 task force team in the community (see table 1).

A semi-structured questionnaire was developed to explore barriers during the implementation of the COVID-19 monitoring system. The question related to information system management, from data collection from the community and health center through the reporting mechanism to the district health office. Interviews were conducted for approximately 30-45 minutes using the national language by phone and WhatsApp messages due to the Large-Scale Social Restriction since the 18th of April 2020.

The interviews were using semi-structured questionnaires and it was recorded and transcribed verbatim. This step continued by the process of coding which classified the ideas and similarities that were exposed through the descriptions given by the respondents. The coding text was analyzed using theming where each theme was built as the heading of a section in the report (Sutton & Austin, 2015).

Results And Discussion

The objective of this research is to describe experiences during the implementation of a COVID-19 information system and to provide information on the lessons learned concerning various interferences to improve awareness of the issues. From the available literature, the

key issues and practical solutions have been extracted to inform policy-makers and planners as to what to consider when analyzing certain factors or when developing strategies to enhance an effective and efficient information system for pandemic purposes. The current research aims to evaluate the barriers and challenges of the implementation of a COVID-19 information system from the perspective of a pandemic task force of a District. Some barriers have been recognized as a result of the interview and classified into three major themes:

Individual Behavior

The predisposition factor of the health care staff plays an important role in the health care organization to form the strengths to run the work process because qualified and motivated human resources are important for adequate health service provision. This includes genetics, attitudinal, personality, and environmental factors that are associated with health, or the lack of it, in a person which correlates to his/her performance. Performance is considered to be a combination of staff being available (retained and present) and staff being competent, productive, and responsive (Van De Velde *et al.*, 2016). Based on earlier research, individual performance such as behavior, knowledge, and competency influences organizational performance (Guo *et al.*, 2017).

One of the major determinants of individual performance is behavior. Negative behavior such as demotivation leads to a poor attitude towards their work by not following the standard protocols and reporting with unstandardized data. The current monitoring and report system during the COVID-19 pandemic in South Tangerang District is described in Figure 1. Based on the interview, all of the respondents agreed that they need an effective information system to simplify their work. Furthermore, competence is defined as the ability to perform a specific task based on knowledge and skills to obtain the desired outcomes. A PHC management staff stated:

“Our problem is in case tracing because we do not have surveillance officers who have the knowledge, commitment, and responsiveness to do the monitoring and report to the system.”

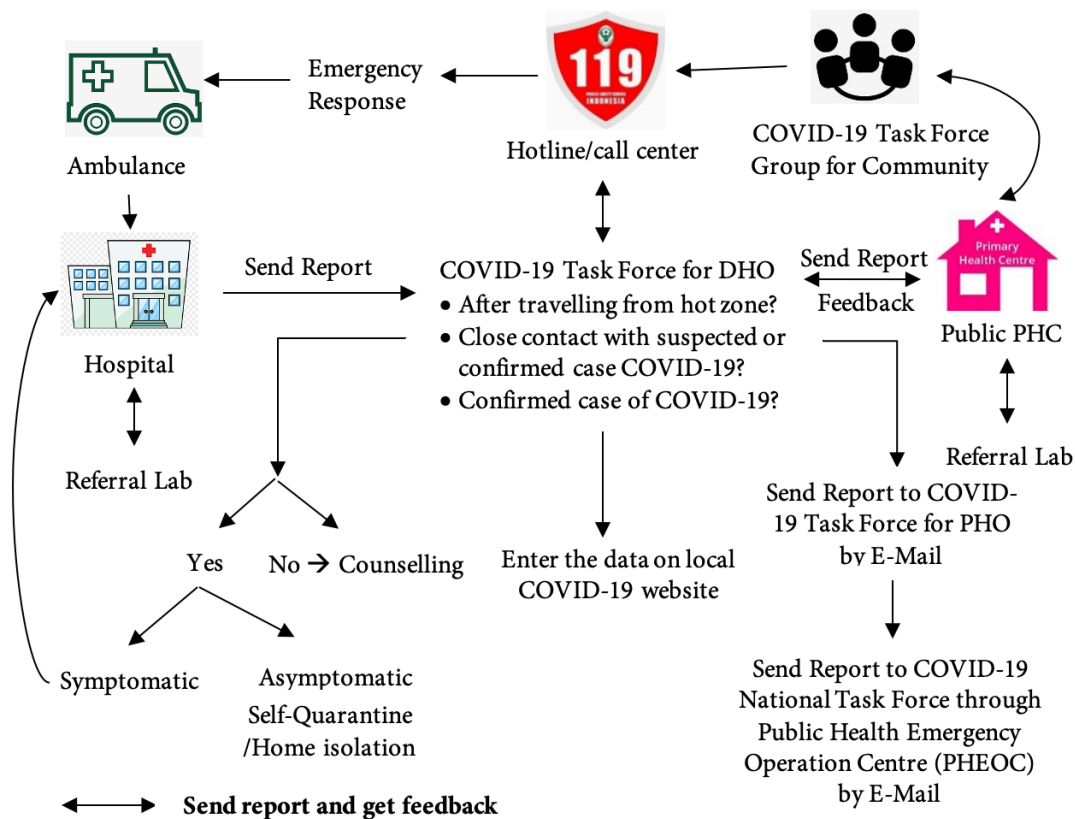


Figure 1. The Current COVID-19 Information System Workflow in District Level

Staff shortages also may limit accessibility to health services and programmes which in turn affect the health outcomes. Poor performance results from too few staff, or from staff not providing care according to standards and not being responsive to the needs of the community and patients (Bradley *et al.*, 2015). As the pandemic highlighted the healthcare system’s human resource challenges, medical staff are insufficient to deal with potentially increasing demands (Mahendradhata *et al.*, 2021).

Data Governance in the Organisation

Data governance consists of a set of processes, roles, policies, and standards that ensure an organization follows an effective and efficient way to use the available information to achieve its goals. It also defines the processes and responsibilities that ensure the quality and security of data used throughout a company or organization. Data governance specifies who can take what actions, on what data, in what circumstances, and with what methods. Respondents from the DHO Task Force stated:

“Public PHCs and hospitals report cases directly to surveillance in the DHO. If someone, let’s say went to the laboratory by himself, and obtained a lab result, he should report it to the Public PHC.”

The performance of health workers depends not only on their competence, knowledge, and skills but also on the availability of facilities or infrastructure to help the work process. Such facilities may increase the motivation of the staff (Forson *et al.*, 2021). Motivation is a driver for better organizational performance. Working conditions in health care organizations such as effective workflow, and supportive operating policies and procedures are related to the staff work motivation.

Communication and Networks

The organizational performance is set to monitor and improve the quality of work. To meet the standards of the organization, health workers need a working environment that allows them to work without problems that may prevent them from achieving outstanding performance. Several factors

within the working environment such as access to information, network, and multi-sectoral communication, may affect the performance of the staff (Bonache & Noethen, 2014). The management of a PHC stated:

“I am so happy that we’ve got support from multi-sectoral coordination to collect the data from the patients. So, we can submit the data on time.”

Lack of public awareness also influences the satisfaction of the health workers. Access to information amongst organizations is also important to increase awareness. According to the WHO framework during the COVID-19 pandemic, coordination and communication among the community elements is critical for effective response to public health emergencies and increased awareness (Stratil *et al.*, 2020). The activation of a Health Emergency Operations Centre (EOC) or other coordination systems such as multi-sectoral coordination is an indication of an adequate pandemic information system. After transcribing, coding, and categorizing the data, we built a thematic schema of the problems using a root cause analysis as seen in Figure 2.

At the very beginning of the pandemic,

it clearly showed there was a failure of the management and organization system behavior in crises. Health personnel play an important role in patient care to management information systems. Earlier research concluded that employee behavior has a significant role to play concerning organizational growth and performance (Guo *et al.*, 2017). Moreover, the combination of experience and competency is essential which must be explored and valued (Vosloban, 2012). Improving personal performance to the highest level becomes a challenge, given the continuous improvement of the healthcare organization (Khan *et al.*, 2019; Sears *et al.*, 2014). In the current research, the lack of awareness, the shortage of staff, a lack of competencies, and heavy workload are identified as barriers which are associated with individual behavior. Earlier studies have proved that individual awareness is an important determinant of organizational achievement (Okpara & Edwin, 2015) and it may have implications for COVID-19 awareness among the healthcare staff. It has been argued that having high self-awareness allows health professionals to comply with a routine surveillance system in a healthcare organization.

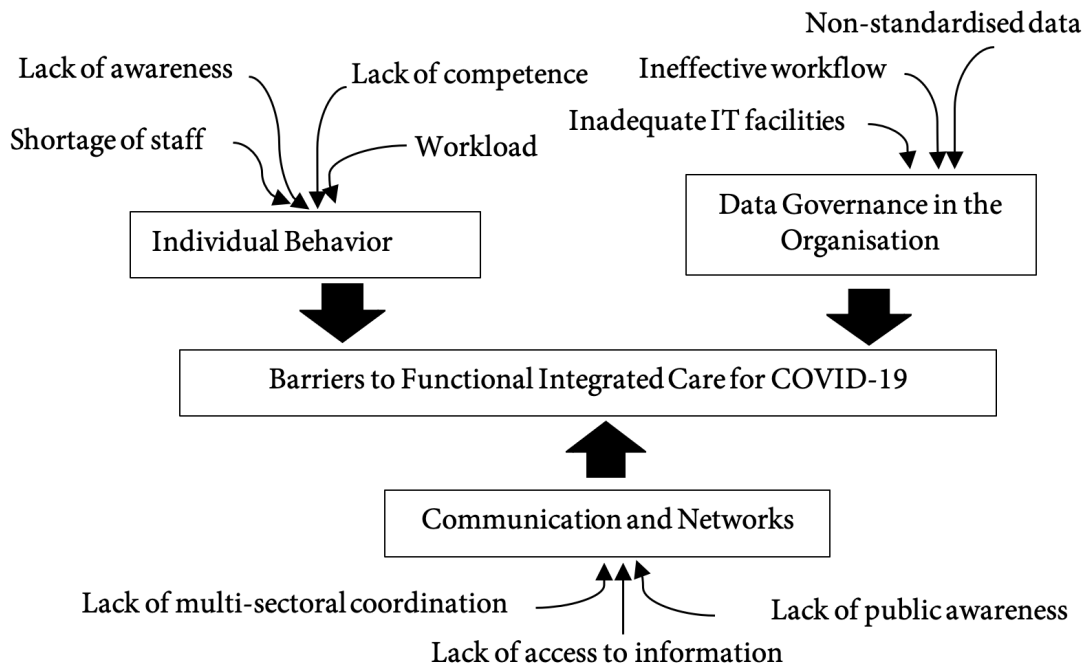


Figure 2. Barriers to Functional Integrated Care for COVID-19 in Indonesia

Furthermore, the importance of the workload on staff performance has been widely acknowledged. The health care workers are human resources with skillful and competent staff with planning, controlling, leading, and staffing functions within the health care organization. Previous research has concluded the negative impact of insufficient personnel is increasing the workload, and decreasing the productivity which brings about inadequate implementation of the work system and reduces its function (Asamani *et al.*, 2015). During the COVID-19 escalation in Indonesia, the health workers form the frontline to perform clinical work as well as trace the confirmed cases which may increase the workload. The evidence of the competencies amongst the health care staff is a different issue. Healthcare organizations are required to prove that the skills of the staff meet the requirements of the workplace. Maintaining a skilled and motivated healthcare workforce during the COVID-19 pandemic is also of major concern as the staff can comply with the existing procedures (Mahendradhata *et al.*, 2021).

Besides the healthcare workforce, data governance during the pandemic is necessarily adequately provided by the government through local to national regulations. From this current research, several factors such as

inadequate facilities, ineffective workflow, and non-standard protocols are identified as barriers associated with good data governance. The limitation of facilities in the district such as clinical laboratory testing brings about difficulty in detecting the confirmed cases. The laboratory staff must send the clinical samples to the referral lab and will only get the result within a week. Earlier research stated that inadequate facilities and the lack of material, which are seen as being beyond the control of health professionals were found to be a source of frustration for many health workers and this affects their motivation, which in turn affects their performance and readiness (Dagne *et al.*, 2015; Merlin & Vanchapo, 2021).

Furthermore, ineffective workflow issues can interfere with productivity and patient care, so addressing such issues may improve organizational performance to enhance the pandemic information system. The workflow of an organization involves a set of procedures that have to be completed, the set of people or other resources available to accomplish the steps, and the interactions among them (Tanzini *et al.*, 2021). People who are involved in health information management should admit the importance of health data and the accessibility of the classifications to provide the information for the public (Shepherd & Groom, 2020).

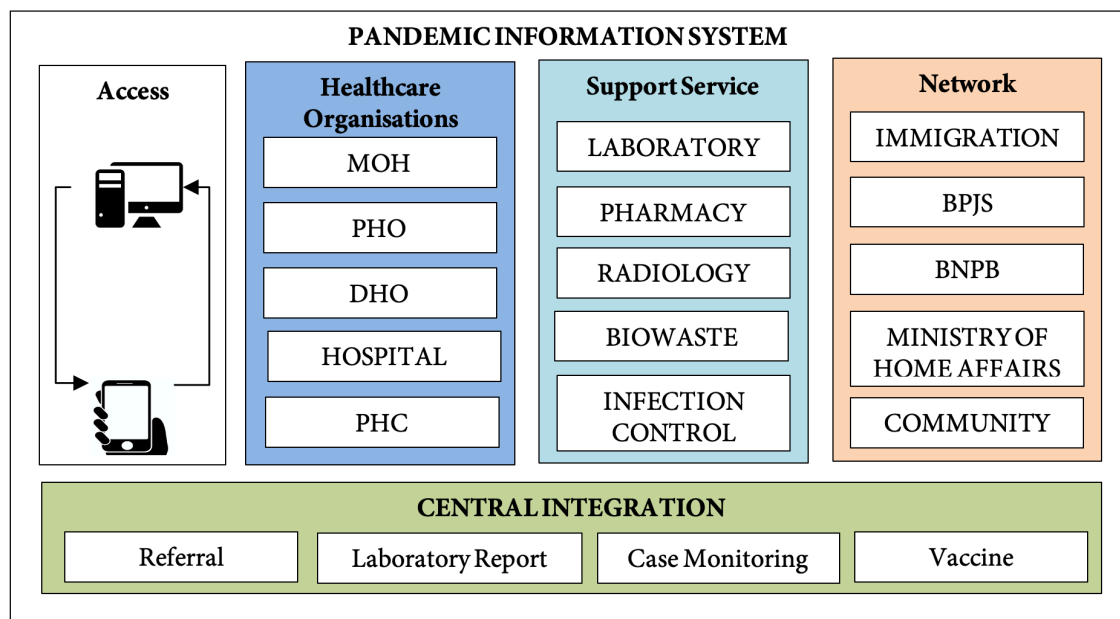


Figure 3. Proposed Design of Pandemic Integrated System (MOH=Ministry of Health, BPJS= Social Health Insurance Administration Body, BNPB= National Disaster Mitigation Agency)

A good workflow will help achieve the goals promptly, deliver more consistently, reliably, safely, and comply with the protocol standards (Nugroho *et al.*, 2021).

The current research shows that there are several barriers related to communication and networks such as a lack of multi-sectoral coordination, a lack of public awareness, and a lack of access to information and these have become barriers to the implementation of the pandemic information system. According to the Framework for a Public Health Emergency Operation Centre (PHEOC) from WHO, a multi-sectoral coordination mechanism has key components such as immediate plans and actions, procedures, infrastructure, information technology (IT) infrastructure, information systems and standards, and human resources (Zhussupov *et al.*, 2022). The use of electronic information systems during the COVID-19 pandemic in the South Tangerang District has been carried out through the local web. However, the website can only be used by the health officers in the District Health Office to manually input the case-reported data by the Public PHC. This may imply that non-real-time data by a healthcare organization is difficult to respond to quickly. Therefore, we proposed an integrated information system design as seen in Figure 3 as the solution for the effective workflow of the COVID-19 monitoring and reporting system.

Conclusion

Certain factors are important to be evaluated for the effective implementation of an integrated system against pandemics such as COVID-19 in Indonesia including individual behavior, data governance in the organization, and communication. To improve the system performance in the organization, there is a need to evaluate the barriers among the above-mentioned factors. The current research involves the Task Force Team of a District in an Indonesian urban area; therefore, the problems cannot be generalized to apply to all regions. It is suggested that a national survey should be conducted to address any gaps in the present study and to include coverage of all the other provinces. Recommendations would be required for multi-sectoral involvement to

support the implementation of a pandemic information system to monitor health data and to build an effective integrated system to improve the information system. A proposed design to improve the effectiveness of the pandemic-integrated system has been developed to enhance the current system. Thus, further research in the IT field for designing, developing, and implementing the national pandemic information system requires urgent attention. The use of Information Technology can find ways to improve the multi-sectoral integration, quality of the health data, and efficient health services during the COVID-19 pandemic.

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