Towards Digital Health Transformation: The Urgency of Electronic Student Health Reports
(*Case Study in* SD Negeri Cipedak 03*, South* Jakarta *and* Puskesmas Jagakarsa)

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Abstract
The community health center (Puskesmas) routinely collects student health examination data in health report books, causing storage, monitoring, and analysis difficulties. This has led to suboptimal health interventions involving parents, schools, and Puskesmas. This research analyzes user needs in developing an electronic-based student health report. This qualitative descriptive study employs the Framework for the Application of System Thinking (FAST) approach. The research was conducted at the Puskesmas Jagakarsa and SD Negeri Cipedak 03, South Jakarta. The study findings indicate utilizing student health report books is not optimal. Based on the needs analysis, there is a necessity to develop an electronic-based student health record. Automated calculation processes and reporting need to be provided by the system with data-sharing mechanisms among users. An interactive and informative dashboard displaying BMI graphs, nutritional status, stunting, anemia, and other physical examination results (dental, eye, ear, hypertension, and others) is essential. A comprehensive and continuous student health history is needed, showing parental health history, student health history, and student immunization history. Digital health transformation in the form of an electronic-based Student Health Report is highly required. This system is expected to enhance the role of parents, schools, and Puskesmas in effectively monitoring student health.
Keywords: digital health transformation, FAST, student health record, system analysis

Menuju Transformasi Kesehatan Digital: Urgensi Rapor Kesehatan Siswa Berbasis Elektronik
(Studi Kasus di SD Negeri Cipedak 03 dan Puskesmas Jagakarsa, Jakarta Selatan)

Abstrak
Puskesmas secara rutin mengumpulkan data hasil pemeriksaan kesehatan siswa pada buku rapor kesehatan. Pendokumentasian masih dilakukan secara konvensional yang menyebabkan kesulitan dalam penyimpanan, monitoring dan analisis. Hal ini berdampak pada belum optimalnya intervensi kesehatan siswa yang melibatkan orang tua, sekolah dan puskesmas. Penelitian ini berfokus melakukan analisis kebutuhan pengguna dalam pengembangan rapor kesehatan siswa berbasis elektronik. Jenis penelitian ini adalah deskriptif kualitatif dengan pendekatan *Framework for the Application of System Thinking* (FAST). Penelitian dilaksanakan di Puskesmas Jagakarsa dan SD Negeri Cipedak 03, Jakarta Selatan. Hasil penelitian menunjukkan pemanfaatan buku rapor kesehatan siswa yang diisi oleh petugas puskesmas belum optimal. Berdasarkan analisis kebutuhan yang dilakukan, perlu dikembangkan catatan kesehatan siswa berbasis elektronik. Proses perhitungan dan pelaporan otomatis perlu disediakan oleh sistem dengan mekanisme berbagi data antarpengguna. Tampilan dashboard perlu dibuat interaktif dan informatif yang menampilkan grafik BMI, status gizi, stunting, anemia, dan hasil pemeriksaan fisik lainnya (gigi, mata, telinga, hipertensi, dan lainnya). Perlu disediakan riwayat kesehatan siswa komprehensif dan berkelanjutan yang menampilkan riwayat kesehatan orang tuanya, riwayat kesehatan, dan riwayat imunisasi siswa. Transformasi kesehatan digital dalam bentuk rapor kesehatan siswa berbasis elektronik sangat dibutuhkan. Sistem ini diharapkan dapat meningkatkan peran orang tua, sekolah, dan puskesmas dalam memantau kesehatan siswa secara optimal.
Kata kunci: analisis sistem, FAST, rapor kesehatan siswa, transformasi kesehatan digital

INTRODUCTION

The health problems encountered by students are notably multifaceted and varied. In primary school, student health issues are generally related to nutritional imbalances, dental health, refractive abnormalities, worms, and infectious diseases related to clean and healthy living behaviors.[1] In contrast, for students in higher levels, such as junior high school, the issues tend to be more related to risky behaviors, including smoking, alcohol consumption, and engaging in premarital sexual activities.[1]

The current situation in Indonesia, particularly in school-age children, includes a 22% prevalence of anemia, 30% prevalence of stunting, 10% prevalence of underweight, and 8% prevalence of overweight.[2] There has been a decline in undernourished prevalence from 37.2% in 2013 to 30.8% in 2018 and a decrease in the rate of childhood obesity from 11.8% in 2013 to 8% in 2018.[3] While the prevalence of adolescents experiencing anemia or iron deficiency has increased from 37.1% in 2013 to 48.9% in 2018.[3]

Poor nutritional status in children, including stunting and wasting, has been shown to harm academic performance.[4] Iron deficiency anemia can also lead to growth and cognitive impairments, affecting the body and brain cells. Additionally, iron-deficiency anemia can weaken the immune system and make individuals more susceptible to infections.[5]

In line with this, the Ministry of Health Republic of Indonesia (MoH RI) has implemented the integrated continuum of care program aimed at achieving a healthy, intelligent, and outstanding generation through the integration of School Health Program (*Usaha Kesehatan Sekolah* or UKS), school disease screening, and school-age child identification efforts. School-age children are a strategic target for health programs; not only do they make up a substantial portion (25%) of the total population, but they are also easily accessible due to their well-organized school structures.[6]

Currently, through the health screening program and routine health examinations conducted in schools, the results of these screenings and periodic health check-ups are recorded in a health report book. However, the manual recording of this information on paper has resulted in difficulties in documentation and further analysis.[7] Manual (hardcopy) recording can also lead to issues like damage or loss of records.[8]

In 2021, the MoH RI issued the Digital Health Transformation policy to promote the use of digital technology for public health in the future.[9] The focus is implementing Electronic Health Records (EHR) in all healthcare facilities.[10]

However, the utilization of this technology has not yet extended to the realm of student health recording in schools.

Electronic health records could improve the predominantly manual (paper-based) healthcare system, aiding healthcare facilities in delivering higher-quality services to the public.[11] Some fundamental benefits of electronic recording include easy access to computerized records and a reduction in potentially illegible handwritten notes, which historically could hinder health history documentation.[12]

Electronic systems can encompass numerous potential capabilities, such as enhancing service quality and cost-efficiency, aiding decision-making and health information exchange, reducing human errors, improving clinical outcomes, facilitating care coordination, and tracking data over time.[13] Health information technology can enhance preventive care outcomes, disease awareness, and self-management.[14]

The current manual student health recording system limits the involvement and participation of parents, schools, and Puskesmas in monitoring students' health status due to a lack of easily accessible information. However, the active involvement of parents and schools plays a significant role in the health status of school-age children.[15] Health information technology can facilitate the sharing of information among users,[16] thus providing health information that is more easily accessible and efficient for users.[17]

To understand the current state of the existing system and its challenges, a system analysis is necessary to assess the operational system comprehensively. System analysis studies a business problem to recommend improvements and determine business needs and priorities as a solution.[18] In this research, a fundamental system analysis of the current health report system will be conducted to identify user issues and needs in detail, as well as to propose alternative solutions.

This study attempts to comprehensively outline the results regarding the need to develop an electronic student health reporting system from the perspectives of parents, schools, and community health centers (Puskesmas). The results of this study will serve as the basis for policies to promptly transform the manual health report into a system based on user needs.

Furthermore, this program is not confined to mere recording and reporting at the Puskesmas only but can also be utilized by parents, schools, and Puskesmas to monitor student health.

METHODS

This research is a qualitative study with a case study approach. The method

utilized in this research is the system analysis method from the Framework for the Application of System Thinking (FAST), using the Model-Driven Development Strategy up to the requirement analysis stage. This research follows three fundamental stages of the FAST method, which are: 1) Scope Definition, 2) Problem Analysis, and 3) Requirement Analysis.[19] In the requirement analysis stage, the researcher used a systemic approach: input, process, and output.

FAST defines stages for identifying and evaluating problems, opportunities, barriers, and expected needs so that improvements can be proposed. Data is collected through in-depth interviews and Focus Group Discussions (FGD). The informants in this research are individuals directly involved in the health screening and periodic health check-up program, who can provide information related to the need for the development of an electronic student health reporting system.

This research is conducted in the Jagakarsa Subdistrict Puskesmas and SD Negeri Cipedak 03, South Jakarta. The research informants include students' parents, the UKS coordinator at SD 03 Cipedak, the UKS Program Manager, and the Jagakarsa Sub-district Puskesmas personnel.

RESULTS

The Scope Definition Stage includes the following steps: Definition and Scope, Opportunity, Possible Solutions, and Benefits. The results of this stage are presented in Table 1.

Table 1. Scope Definition Stage

Stages	Results
Definition and Scope	The student health report follows the Technical Guidelines from the Ministry of Health in 2018 regarding health report books. The report is filled out by Puskesmas personnel using conventional documentation to record and report the results of student health examinations.
Opportunity	Student health monitoring can be optimized through digital transformation for data collection, data sharing, and further analysis.
Possible Solutions	Development of an electronic health report.
Benefit	Reducing printing costs, enabling all students to have access to health reports.

Based on the research findings, it was found that not all students have health report books due to limited stock availability. As a result, the history of student health examination results conducted regularly at school is not well-documented. The roles of parents, schools, and Puskesmas have also not been optimized for monitoring the results of student health examinations. The problem analysis stage involves asking users to identify issues with the current system.[16] The objective is to identify problems within each business process in the current system.

Table 2. Problem Analysis

Topics	Results
Student Health Report Book Distribution	• Issue: Not all students have health report books. • Cause: The health report books are printed by the Puskesmas due to a limited budget, resulting in the limited availability of health report books. The school also does not have a budget for printing these health report books. • Impact: The unequal distribution of health report books among students leads to not all students having their health history documented and being unmonitored.
Data Collection Process	• Issue: Double Entry. Puskesmas personnel first record the data on health examination registration forms before being recorded in the health report book. Puskesmas personnel also need to input it into Excel for analysis. • Cause: The recording is still conducted manually in stages as per the aforementioned issue, and an electronic recording system is not yet available. • Impact: Risk of paper loss, damage, and time-consuming data collection
Data Processing/ Analysis	• Issue: Puskesmas personnel need to manually analyze numerous datasets from each school, making it very time-consuming, and the information doesn't promptly reach the relevant stakeholders. • Cause: Manual data analysis and subsequent input into MS Excel for submission to the Department of Health. • Impact: Inefficiency, an increased risk of human error in data processing (Puskesmas personnel), and the student health monitoring process by school, parents and Puskesmas also does not run well because the information provided is already outdated (due to the lengthy analysis process).
Data Visualisation	• Issue: The student health report book only provides information in text form, thus there is no data visualization created by the Puskesmas personnel. • Cause: The format of information in the student health report book is in textual form. Additionally, the data analysis process conducted by Puskesmas personnel must be done manually, making it difficult and time-consuming to visualize the data. • Impact: The resulting information becomes less informative, and the process of monitoring student health by parents, schools, and Puskesmas becomes more difficult and suboptimal.
Data Utilization	• Issue: Data utilization is not optimal. • Cause: Parents and schools, have difficulty accessing student health data and information. • Impact: Monitoring and evaluation of student health become not optimal

DISCUSSION

The UKS program is a series of activities ranging from health screening and periodic examinations to student health education. Each process generates data and information used to monitor students' health status. Quality data and information are needed for planning, monitoring, and evaluating health programs.[20]

Currently, the problem faced in managing the UKS at the Jagakarsa Sub-district Puskesmas is the inadequate management of data and information needed for student health records. This has resulted in suboptimal early detection of nutrition problems and monitoring of students' health status by parents, schools, and Puskesmas. This is because the existing system at the Jagakarsa Sub-district Puskesmas does not have a database management system for collecting and managing data from student health examinations. Accurate and up-to-date data

and information are essential for every health program to carry out monitoring, evaluation, and planning.[20]

Without accurate and timely data, the UKS program in schools cannot function optimally. The current system at the Jagakarsa Sub-district Puskesmas is unable to provide detailed information about the health history and examination results of all students. Data collection, aggregation, processing, and analysis are still manual, resulting in inaccurate data and time-consuming processes, hindering effective health monitoring.

The main challenge faced by the UKS in Jagakarsa sub-district is the uneven distribution of school health report books. According to the Minister of Health Regulation No. 43 of 2016 on Minimal Service Standards in the Health Sector, the government is obliged to distribute health report books and document the results of health screenings and periodic health examinations into these books every year.[21]

Following the Technical Guidelines for the Use of Health Report Books in 2015, parents, schools, and Puskesmas are required to monitor students' health statuses. However, monitoring students' health statuses is suboptimal due to limited recording media and the lack of periodic health examination results integration.[1]

The limited availability of data and information, their incompleteness, and the time-consuming nature of their management make it difficult for UKS program managers to monitor students' health. The data generated are also challenging for parents and schools to access. Therefore, developing an electronic Student Health Report prototype (e-Student Health Report) that integrates all entities, including parents, schools, Puskesmas, and district health centers, is necessary. Involving stakeholders during all stages of a care management program can lead to early buy-in, successful program design, and the establishment of long-term support for the program.[22]

Developing this information system prototype requires a database management system that can be used as a uniform data collection system, can be accessed jointly, and can better manage and analyze data. Engaging stakeholders like parents, schools, Puskesmas, and district health centers requires seamless system access. User accounts with passwords facilitate their active participation in managing health-related information effectively. Users demand minimized manual efforts and sophisticated tools for efficient data visualization and analysis.

Sufficient funding is essential for sustainable system development. This encompasses initial costs, training, and ongoing operational expenses such as technical support and data management.

Long-term sustainability ensures continuous system functionality to meet user needs effectively. In summary, ensuring smooth user engagement, optimizing technology for efficient data handling, and securing adequate financial backing are pivotal for an effective healthcare information system catering to stakeholders' diverse needs.

Several essential benefits of electronic recording include easy access to computerized records and reduced difficulty reading handwritten records, which has historically hindered health record keeping.[12] Electronic systems have the potential to enhance service quality and cost efficiency, assist in decision-making and health information exchange, reduce human errors, improve clinical outcomes, facilitate care coordination, and track data over time.[13] Numerous studies have shown that health information technology improves prevention outcomes, disease awareness, and self-management.[23,24]

CONCLUSION

Throughout this research, an analysis of the current state of the Student Health Report system at SD Negeri Cipedak 03, South Jakarta, and Puskesmas Jagakarsa has been conducted. The study encompassed various facets, including the existing issues derived from the analysis of the current situation and the insights gained

from in-depth interviews and FGD involving key stakeholders.

The findings underscore the inefficiencies and limitations within the current manual system, particularly concerning the uneven distribution of Health Report Books among students, double-entry data recording processes, data processing and analysis challenges, and inadequate data utilization. These issues collectively impede effective health monitoring and evaluation for students by parents, schools, and Puskesmas.

As a result of this thorough analysis, it is evident that the implementation of a digital health transformation in the form of an electronic-based Student Health Report is imperative. The transition from the conventional paper-based system to an electronic system will address the identified challenges and streamline the process of data collection, processing, visualization, and utilization. The proposed electronic system is anticipated to enhance the accessibility, accuracy, and timeliness of health-related information.

The recommendation is to initiate the development of an electronic-based Student Health Report system. Furthermore, the system should be designed to provide interactive dashboards, automated data processing capabilities, and user-friendly interfaces accessible to parents, schools, and Puskesmas. This enhances the role of

parents, schools, and Puskesmas in effectively monitoring student health.

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