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Optimizing Inter-Facility Referrals and Patient Appointment Scheduling through BGH-ORAS: A Digital Health Innovation for Geographically Isolated Communities in the Philippines

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A B S T R A C T :

Background: In geographically isolated and disadvantaged areas (GIDAs) such as Batanes, limited health infrastructure, weather-dependent transport, and fragmented communication systems contribute to delays in patient care and inefficient health service delivery. In response to these challenges, Batanes General Hospital (BGH) launched the BGH-ORAS (Online Referral and Appointment System) on July 16, 2025, to improve coordination between referring facilities and streamline hospital scheduling workflows.

Objective: This study aimed to evaluate the effectiveness, usability, and challenges of BGH-ORAS in improving inter-facility referrals and patient appointment scheduling in a remote island-based healthcare system.

Methods: A convergent mixed-methods design was used. The quantitative component analyzed system-generated data from July 16 to October 15, 2025, covering 2,093 referrals—1,454 patient referrals (69.47%) and 639 laboratory referrals (30.53%). A structured questionnaire was completed by 86 respondents (BGH staff, RHU personnel, and patients). For the qualitative component, 12 key informant interviews (KIIs) were conducted with frontline users and referring providers. Data were analyzed using descriptive statistics and thematic coding aligned with the Diffusion of Innovations Theory and Health Systems Theory.

Results: The system was widely accepted across facilities, with 93% of respondents reporting ease of use and 88% expressing overall satisfaction. BGH-ORAS contributed to reduced outpatient congestion, improved appointment flow, and faster referral feedback—73.3% of RHUs received confirmation within 24 hours. However, intermittent internet access and limited technical training in some RHUs were noted barriers. Stakeholders recommended continuous training, expansion of modules (e.g., radiology, pharmacy), and the designation of system focal persons per facility.

Conclusion: The implementation of BGH-ORAS has significantly improved inter-facility communication and patient scheduling in one of the Philippines' most remote provinces. It demonstrates that digital health tools, when designed with context and community in mind, can enhance service delivery, even in the most geographically isolated settings. The study recommends scale-up of similar digital platforms across other GIDAs under the Universal Health Care framework and DOH's National Digital Health Strategy

Keywords: Digital health, online referrals, appointment system, BGH-ORAS, rural healthcare, health system innovation, GIDA, Batanes

INTRODUCTION

The advancement of digital health technologies has reshaped healthcare delivery in recent years, particularly in regions where access to medical services is constrained by geography, infrastructure, or socioeconomic limitations. For the province of Batanes—a geographically isolated and disadvantaged area (GIDA) in the northernmost part of the Philippines—these limitations are pronounced due to insular terrain, limited transportation, and the frequent impact of typhoons and rough seas. These geographic challenges often disrupt patient access to timely care and strain the capacity of its only Level II hospital, Batanes General Hospital (BGH).

In response to these persistent barriers, BGH implemented the Batanes General Hospital Online Referral and Appointment System (BGH-ORAS) on July 16, 2025, aiming to streamline inter-facility communication and improve patient scheduling. The platform integrates online referrals from municipal Rural Health Units (RHUs) and enables patients to book appointments remotely through a user-friendly interface. This research investigates how BGH-ORAS addresses critical access gaps and enhances health system responsiveness in a GIDA setting. It further situates the initiative within the broader digital health transformation advocated by the World Health Organization (WHO, 2021) and the Philippine Department of Health's Universal Health Care (UHC) strategy.

BACKGROUND

Batanes is composed of 10 islands, three of which—Basco, Sabtang, and Itbayat—are populated and host basic healthcare infrastructure. However, medical emergencies and routine follow-ups are often centralized at BGH, the sole DOH-retained Level II hospital in the province. Prior to the launch of BGH-ORAS, referrals from barangay health stations and RHUs were conducted manually or via mobile messaging apps, resulting in delays, missed information, and patient dissatisfaction. Walk-in appointments contributed to congestion at the Outpatient Department (OPD), leading to long waiting times and inefficient resource use.

BGH-ORAS was developed to address these systemic gaps. By allowing physicians to electronically endorse patients and enabling residents to book appointments remotely via the oars.bgh.com.ph platform, the hospital aimed to decongest waiting areas, minimize paper-based transactions, and improve inter-municipality coordination. This approach aligns with digital innovations emphasized in the DOH National eHealth Strategic Framework and Plan (2020–2025), which encourages ICT-enabled service delivery in underserved areas (Department of Health, 2021).

The system's introduction also came at a time of increasing climate threats. In previous years, Super Typhoon Ferdie (2016) and Typhoon Kiko (2021) demonstrated how natural hazards compromise access to hospital-based services in Batanes. In such emergencies, digital tools like BGH-ORAS allow for continued triage, prioritization, and communication among care providers. Importantly, the platform's relevance extends beyond emergencies—its daily operational use reinforces patient safety, enhances continuity of care, and empowers both patients and providers to participate actively in the care process.

This study aims to measure the platform's impact on key performance indicators such as appointment fulfilment rate, referral response time, and user satisfaction. Furthermore, it explores how a digital health innovation like BGH-ORAS can serve as a model for other GIDAs in the Philippines, highlighting the value of local solutions tailored to community needs.

Theoretical Framework

This study is anchored on two interrelated theories that together explain the design, implementation, and outcomes of the Batanes General Hospital Online Referral and Appointment System (BGH-ORAS): Rogers' Diffusion of Innovations Theory and Systems Theory in Health Care. The integration of these perspectives provides a comprehensive understanding of how digital health innovations evolve within a complex, geographically isolated health system such as that of Batanes General Hospital (BGH).

1. Diffusion of Innovations Theory (Rogers, 2003)

Rogers' Diffusion of Innovations Theory emphasizes that the adoption of a new idea or technology depends on how potential users perceive its relative advantage, compatibility, complexity, trialability, and observability. Within this study, the theory explains how BGH-ORAS—a digital platform introduced in July 2025—was adopted and sustained by healthcare professionals and patients in Batanes.

The relative advantage of BGH-ORAS lies in its ability to significantly improve referral turnaround time and reduce outpatient congestion compared to the former paper-based system. This mirrors findings by Robles and Gabriel (2022), who observed that perceived efficiency and convenience are strong motivators for health workers' adoption of digital tools in Philippine local health systems. The compatibility of BGH-ORAS with existing referral workflows in BGH and its Rural Health Units (RHUs) also facilitated acceptance, as it aligned seamlessly with existing practices rather than replacing them entirely.

The theory's principle of complexity likewise applies to the hospital's experience. Since the system was designed with a simple, bilingual interface, both hospital and RHU users—including midwives and barangay health workers with limited digital literacy—were able to use it with minimal orientation. This reinforces Llave and Baggao's (2023) argument that digital health tools succeed in rural and island settings when they are designed around user familiarity and local context.

Furthermore, trialability was evident as selected departments initially piloted the system before province-wide rollout, allowing feedback and iterative improvement. Observability, the fifth attribute, manifested through visible benefits such as shorter waiting times and faster feedback, which encouraged other users to adopt the platform. In alignment with the World Health Organization's (2021) global digital health strategy, the diffusion of BGH-ORAS exemplifies how end-user trust and observable improvements drive the sustainable use of innovations in constrained environments.

In summary, this theory provides the behavioral and social foundation for understanding how health workers and patients in a geographically isolated setting embraced a digital system once they perceived tangible improvements in workflow and service efficiency.

2. Systems Theory in Health Care (Von Bertalanffy, 1968; Paina & Peters, 2012)

Complementing Rogers' model, Systems Theory explains how the hospital and its network of RHUs operate as a single, interdependent system. According to Von Bertalanffy (1968), organizations consist of interacting components whose performance depends on coordination and feedback. Applied to BGH,

the introduction of BGH-ORAS altered several system elements—inputs, processes, and outputs—creating new patterns of interaction among clinical departments, referral units, and patients.

As Paina and Peters (2012) describe in health-system applications of systems thinking, sustainable interventions require a balance between internal functions and external influences. In this study, the inputs included digital infrastructure, administrative support, and trained users. The processes encompassed online scheduling, electronic referrals, triage validation, and inter-facility feedback. The outputs were improved patient flow, reduced referral delays, and increased satisfaction among staff and clients.

Each of these components interacts dynamically: connectivity issues in RHUs affect hospital scheduling; staff training influences data accuracy; and user feedback drives software refinement. Thus, BGH-ORAS functions not as an isolated platform but as a cyber-physical subsystem embedded within the province's health ecosystem. This interpretation aligns with Ulep, Dela Cruz, and Uy (2021), who argued that digital initiatives in the Philippines succeed only when integrated into broader governance, infrastructure, and policy systems.

Feedback loops—such as periodic user evaluations and IT troubleshooting—reflect what Paina and Peters (2012) term adaptive learning systems, where interventions evolve through continuous feedback and contextual adjustment. Within BGH, this systemic approach ensures that even amid disruptions from typhoons or power outages, the hospital can maintain coordination with RHUs and continue essential services.

3. Integration of the Two Theories

Integrating Diffusion of Innovations and Systems Theory allows a deeper understanding of both individual adoption and institutional functionality. While Rogers' model focuses on user perception and behavioral acceptance, Systems Theory addresses organizational coordination and sustainability. Together, they provide a dual lens that explains why the BGH-ORAS initiative succeeded in a setting characterized by limited resources yet strong institutional commitment.

In the context of BGH, the diffusion process (Rogers, 2003) unfolded within a system of interacting subsystems (Von Bertalanffy, 1968), influenced by leadership support, community trust, and technological adaptation. As the system matured, observable benefits strengthened motivation, leading to continuous feedback and further diffusion—a process consistent with the learning-cycle model of Paina and Peters (2012).

Ultimately, these theories converge in demonstrating that digital transformation in healthcare is both a social diffusion process and a systemic adaptation process. The BGH-ORAS case in Batanes confirms that even small hospitals in geographically isolated provinces can effectively integrate digital tools when innovations are perceived as beneficial, compatible, and observable, and when systemic structures support feedback, adaptation, and inter-organizational coordination.

This theoretical grounding underpins the study's conceptual framework and justifies its use of the Input–Process–Output (IPO) model to examine how BGH-ORAS translates resources and actions into measurable improvements in access, efficiency, and patient safety.

Conceptual Framework

The conceptual framework guiding this study is grounded in the Input–Process–Output (IPO) model, widely used in health systems research and digital health implementation studies. This model helps articulate how specific resources (inputs) and operational strategies (processes) lead to measurable service outcomes (outputs). The IPO model is suitable for evaluating complex systems like digital health innovations, where technological, human, and systemic factors interact (Llave & Baggao, 2023).

For this study, the BGH-ORAS (Batanes General Hospital Online Referral and Appointment System) is conceptualized as a digital health intervention implemented in a geographically isolated, low-resource context. The goal is to analyze how its design, deployment, and use influence inter-facility coordination, patient scheduling, and health service delivery outcomes.

IPO Model Adapted to BGH-ORAS

Inputs

These are the necessary resources and conditions required to support the implementation of BGH-ORAS.

- Digital Infrastructure (BGH-ORAS web platform, servers, internet connectivity)
- Human Resources (IT staff, OPD/ER/ward schedulers, RHU referral officers)
- Administrative Policies and Training (Orientation on system use, protocols)
- Stakeholder Support (BGH Management, DOH, Local Government Units) • Patient Readiness (Basic digital literacy, access to mobile devices or internet cafés)

Processes

These refer to the activities and mechanisms that facilitate the functioning of BGH-ORAS.

- Online Scheduling by Patients (appointment selection, confirmation)
- Electronic Inter-Facility Referrals (from RHUs to BGH departments)
- Digital Triage and Case Prioritization (by assigned BGH staff)
- Monitoring and Feedback Loops (e.g., patient satisfaction surveys, IT troubleshooting)
- Integration with Manual Systems (for walk-in cases or backup procedures)

Outputs

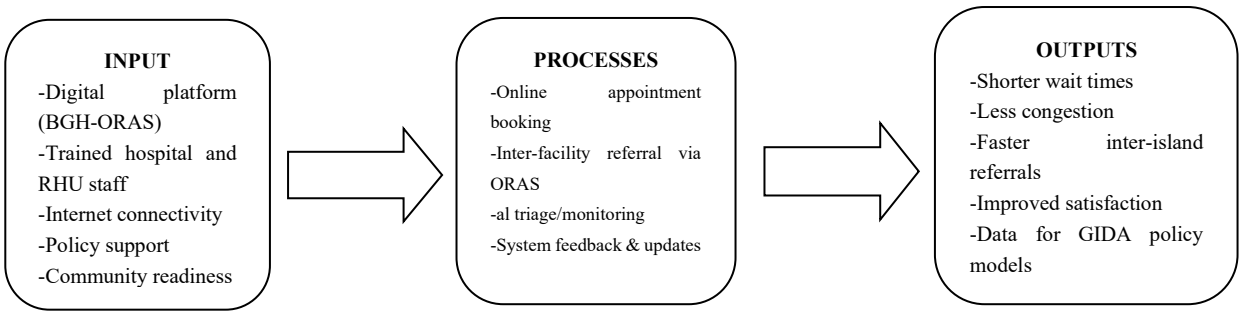
These are the expected outcomes measured in the study.

- Improved Patient Flow and Reduced OPD Congestion
- Shorter Referral Turnaround Times
- Enhanced Inter-Island Health System Coordination
- Higher Patient and Health Worker Satisfaction
- Evidence for Policy Recommendations in Other GIDA Settings

Framework Focus

The framework assumes that when sufficient digital infrastructure and human capacity are in place (inputs), and if the system is implemented with clarity and coordination (processes), then positive changes in service delivery and system responsiveness (outputs) can be observed. This alignment is particularly crucial in isolated areas like Batanes, where time, distance, and weather can critically delay care (Robles & Gabriel, 2022; WHO, 2021). —

Figure 1. Conceptual Framework of the Study Using the IPO Model



Objective of the Study

General Objective:

To evaluate the implementation and impact of the BGH-ORAS digital referral and appointment system in improving access, efficiency, and coordination of healthcare services at Batanes General Hospital.

Specific Objectives:

1. To describe the operational framework and functionality of BGH-ORAS, including user interface design, coverage areas, referral workflow, and appointment booking process.
2. To determine the impact of BGH-ORAS on patient volume management, including changes in outpatient department congestion and appointment fulfilment rates before and after implementation.
3. To assess the reduction in referral turnaround time between Rural Health Units and BGH since the launch of the online system.
4. To examine the level of user satisfaction among patients and health workers (doctors, nurses, RHU personnel) regarding the accessibility, reliability, and usability of BGH-ORAS.
5. To identify the challenges and limitations encountered during the system's implementation, including connectivity issues, personnel readiness, and digital literacy.
6. To generate evidence-based recommendations for scaling and sustaining BGH-ORAS and replicating the model in other GIDA provinces in

the Philippines**.**

Definition of Terms

As used in this study, the following terms are conceptually and operationally defined to guide clarity, consistency, and contextual accuracy.

BGH-ORAS- (Batanes General Hospital – Online Referral and Appointment System) The hospital's digital platform launched on July 16, 2025, designed to streamline patient appointment scheduling and inter-facility referrals across RHUs and internal departments (OPD, ER, Wards, Laboratory). BGH-ORAS enables healthcare providers and patients to coordinate services electronically, reduce walk-in congestion, and minimize delays in service delivery. It serves as the central focus of this study.

Inter-Facility Referral - A process by which patients are digitally endorsed by health providers from one facility (usually a Rural Health Unit or Barangay Health Station) to another (usually BGH) for further management, diagnostics, or higher-level care. In this study, referral is facilitated electronically through BGH-ORAS and includes submission of clinical abstracts, diagnostic requests, and triage notes.

Appointment Scheduling - The digital allocation of specific consultation time slots to patients through the BGH-ORAS platform. It allows patients or referral units to request outpatient or diagnostic appointments in advance. In this study, appointment scheduling is measured by fulfillment rate, user satisfaction, and its impact on outpatient congestion.

Geographically Isolated and Disadvantaged Area (GIDA) - A classification used by the Philippine Department of Health to describe communities that face physical, logistical, or socioeconomic barriers to healthcare access due to remoteness, limited infrastructure, or environmental vulnerability. Batanes, as a multi-island province frequently affected by typhoons and limited transport routes, is considered a GIDA. This study evaluates how a digital platform addresses health system gaps within such a context.

Referral Turnaround Time - The duration between the time a referral is submitted via BGH-ORAS and the time it is acknowledged or acted upon by the receiving unit. It is used in this study as a performance indicator to assess system efficiency.

Digital Health Innovation - Any technology-based solution that enhances the delivery, coordination, or management of healthcare services. In this study, BGH-ORAS is treated as a digital health innovation specifically designed for low-resource, geographically isolated contexts, in alignment with the World Health Organization's (2021) digital health strategy.

User Satisfaction - The degree to which healthcare workers and patients feel that BGH-ORAS meets their expectations in terms of ease of use, reliability, and usefulness. In this study, satisfaction is measured through structured questionnaires and analyzed through both quantitative ratings and open-ended responses.

Systems Theory - An organizational theory that views institutions like hospitals as composed of interrelated subsystems that must coordinate effectively to function optimally. It underpins this study's interpretation of how BGH-ORAS interacts with infrastructure, human resources, workflow, and feedback mechanisms (Von Bertalanffy, 1968; Paina & Peters, 2012).

Diffusion of Innovations Theory - A behavioral theory developed by Everett Rogers (2003) that explains how, why, and at what rate new technologies are adopted by members of a social system. This theory is used in the study to frame how users perceive, adopt, and sustain the use of BGH-ORAS.

Key Informant Interviews (KIIs) - A qualitative data collection method used in the study to gather in-depth insights from individuals directly involved with BGH-ORAS—such as RHU staff, hospital users, and patients. These interviews help contextualize the system's benefits, challenges, and perceived impact.

Mixed-Methods Design - A research approach that combines quantitative and qualitative techniques to provide a more comprehensive understanding of a research problem. In this study, structured surveys and system-generated data are analyzed alongside key informant interviews to evaluate BGH-ORAS.

Patient Congestion - The condition wherein a hospital department, especially the Outpatient Department (OPD), receives more patients than it can handle efficiently at a given time. This study examines how appointment scheduling via BGH-ORAS helps regulate patient traffic and reduce unnecessary crowding.

Referral Feedback Mechanism - The digital or manual process of informing the referring facility about the status, outcome, or action taken regarding a referred case. In this study, the timeliness and completeness of feedback via BGH-ORAS are assessed as indicators of system responsiveness.

Health System Readiness - The capacity of a hospital or network of facilities to adopt, implement, and sustain digital interventions. This includes leadership support, IT infrastructure, user skills, and institutional policies. The concept is evaluated here using Systems Theory principles.

Universal Health Care (UHC) - The Philippine government's mandate, under Republic Act No. 11223, to ensure that every Filipino has access to a full

continuum of quality health services without financial hardship. This study contributes to the UHC goal by evaluating how digital innovation like BGH-ORAS promotes access and equity in a GIDA province.

Scope and Limitations of the Study

This study is primarily anchored on assessing the functionality, effectiveness, and perceived impact of the BGH-ORAS (Online Referral and Appointment System) as a digital health innovation implemented in Batanes General Hospital starting July 16, 2025. The research covers the inter-facility referral workflows and digital appointment scheduling mechanisms facilitated by BGH-ORAS, particularly focusing on three domains:

1. timeliness of patient referrals,
2. reduction of outpatient congestion, and
3. satisfaction and usability from the perspective of frontline users and patients.

Scope

1. Geographic Scope - The study is conducted within the province of Batanes, encompassing the main island (Basco, Mahatao, Ivana, Uyugan) and the remote municipalities of Sabtang and Itbayat. It specifically targets BGH, the only DOH-retained Level 2 hospital in the province, and its referring facilities such as Rural Health Units (RHUs), District Hospitals, and BUCAS (Bagong Urgent Care and Ambulatory Services) Centers.

2. Time Frame - The data collection period covers July to November 2025, allowing sufficient time to observe the actual use, user adaptation, and outcomes of the BGH-ORAS platform post-implementation. Both retrospective system logs and prospective user surveys are included.

3. Respondents - Respondents include:
- Frontline healthcare workers who use BGH-ORAS (referring physicians, nurses, clerks, medical technologists).
- Patients or their representatives who booked appointments or were referred using the system.
- Select hospital administrators and IT focal persons who oversee system governance. The sample size is determined based on total users recorded in the BGH-ORAS system logs within the reference period, with stratified random sampling applied for survey administration.

4. Thematic Coverage The study investigates:
- The efficiency of referral acknowledgment and patient handoff
- The rate and fulfillment of scheduled appointments
- Satisfaction levels from both patient and provider perspectives
- Barriers encountered during the system's implementation and daily use
- Perceived alignment with Universal Health Care and service equity goals

5. Framework Application - The research is grounded in Systems Theory and Diffusion of Innovations Theory to understand how BGH-ORAS functions within institutional subsystems and how its adoption is influenced by perceived relative advantage, compatibility, and observability.

Limitations

1. Limited Generalizability As the research is context-specific to Batanes General Hospital, a geographically isolated setting, its findings may not be fully generalizable to urban or mainland hospital settings where connectivity, staffing, and system maturity differ significantly.

2. Technological Constraints Due to unstable internet connectivity and intermittent power interruptions common in Batanes, some digital transactions may not have been completed in real-time. This may have impacted the completeness of referral and appointment logs and slightly skewed quantitative metrics.

3. Self-Reported Data Bias Patient and provider satisfaction are measured through self-administered surveys and interviews, which may be subject to recall bias, social desirability bias, or misinterpretation of Likert-scale items. While mitigation strategies such as anonymity and triangulation are applied, a degree of subjectivity remains inherent.

4. Exclusion of Clinical Outcomes While the study focuses on operational efficiency and system perception, it does not measure clinical outcomes or long-term health impacts of using BGH-ORAS (e.g., morbidity reduction, readmission rates), which would require longitudinal follow-up beyond the study's timeline.

5. Dependence on Manual Backup Systems In periods when BGH-ORAS was unavailable, referring facilities reverted to offline logbooks or manual coordination, which were not uniformly documented. Hence, referral completeness and time metrics during downtime may have been underreported.

6. Implementation Phase Effects Since the study captures the early stage of implementation, certain responses may reflect transitional challenges such as unfamiliarity with system features, lack of technical training, or incomplete integration across departments—issues that may normalize over time and differ from future evaluations.

Methodology

Research Design

This study will employ a convergent parallel mixed-methods design, integrating both quantitative and qualitative data to evaluate the implementation and outcomes of the BGH-ORAS (Batanes General Hospital Online Referral and Appointment System). The combination of statistical trends and stakeholder perceptions provides a comprehensive analysis of how the system functions in a geographically isolated, resource-constrained environment. The quantitative component will assess operational performance metrics such as referral volume, turnaround time, and outpatient scheduling patterns. The qualitative component will explore user experiences, satisfaction, and implementation challenges among patients and healthcare staff.

Study Setting

The research will be conducted at Batanes General Hospital (BGH), a Department of Health (DOH)-retained Level II hospital located in Basco, Batanes, Philippines. BGH serves as the primary referral center for all municipalities in the province, including Itbayat, Sabtang, Mahatao, Ivana, and Uyugan. Given Batanes' remote geography and susceptibility to severe weather conditions, the integration of BGH-ORAS into the hospital's operations represents a significant digital transformation in service delivery. The hospital's online system (**https://oars.bgh.com.ph**) is accessible by RHUs, patients, and internal departments including OPD, ER, Wards, and Laboratory.

Study Population and Sampling

Quantitative Component: The study will analyze all digital referrals and appointments recorded in BGH-ORAS from July 16, 2025 (date of implementation), to October 15, 2025. This includes:

- Patient referrals (n = 1,454)
- Laboratory referrals (n = 639)
- Total: 2,093 referral entries

This census approach ensures complete inclusion of system usage within the defined timeframe, eliminating sampling bias.

Qualitative Component:

Purposive sampling will be used to select:

- 10 patients who used BGH-ORAS for appointments
- 10 healthcare providers (physicians, nurses, RHU staff)
- 5 administrative or IT personnel directly involved in the platform's operation and maintenance Participants will be selected to reflect diversity in geography (municipality of origin), frequency of system use, and role in the referral/appointment process.

Data Collection Methods

Quantitative Data Collection:

System-generated referral data will be retrieved from the BGH-ORAS backend dashboard. The dataset includes:

- Date and time of referral
- Type of referral (patient vs. laboratory)
- Originating unit (RHU or hospital)
- Receiving department
- Status (accepted, pending, completed)
- Appointment completion rate These data will be compiled into a database and analyzed using descriptive and inferential statistics.

Qualitative Data Collection:

Key informant interviews (KIIs) will be conducted using a semi-structured interview guide. Topics will include:

- User experience navigating the BGH-ORAS platform
- Perceived accessibility, ease of use, and reliability
- Benefits and challenges in system implementation
- Suggestions for improvement Interviews will be audio-recorded (with consent), transcribed verbatim, and analyzed thematically.

Data Analysis Plan

Quantitative Analysis: Data will be processed using SPSS v27. Descriptive statistics (frequency, mean, standard deviation) will describe referral patterns. Paired t-tests or chi-square tests may be used to compare service performance indicators (e.g., OPD congestion or referral delays) pre- and post-BGH-ORAS, subject to availability of baseline data.

Qualitative Analysis: A thematic analysis approach will be used. Transcripts will be coded using both deductive (based on interview guide) and inductive (emergent themes) methods. NVivo software will aid in organizing patterns and linking themes to system design, user satisfaction, and implementation barriers.

Ethical Considerations

This study will strictly follow the ethical standards outlined in the National Ethical Guidelines for Health and Health-Related Research (NEGHHRR) of the Philippines. The research protocol will be submitted to an accredited Institutional Review Board (IRB) for ethical clearance prior to implementation.

- Informed consent will be obtained from all interview participants.
- Confidentiality of patient records and referral data will be maintained through data anonymization.
- Participation will be voluntary, with no penalty for refusal or withdrawal at any point.
- Only aggregated data will be reported in publications to avoid any individual identification.

Results and Discussion

1. **Quantitative Findings from BGH-ORAS Dashboard**

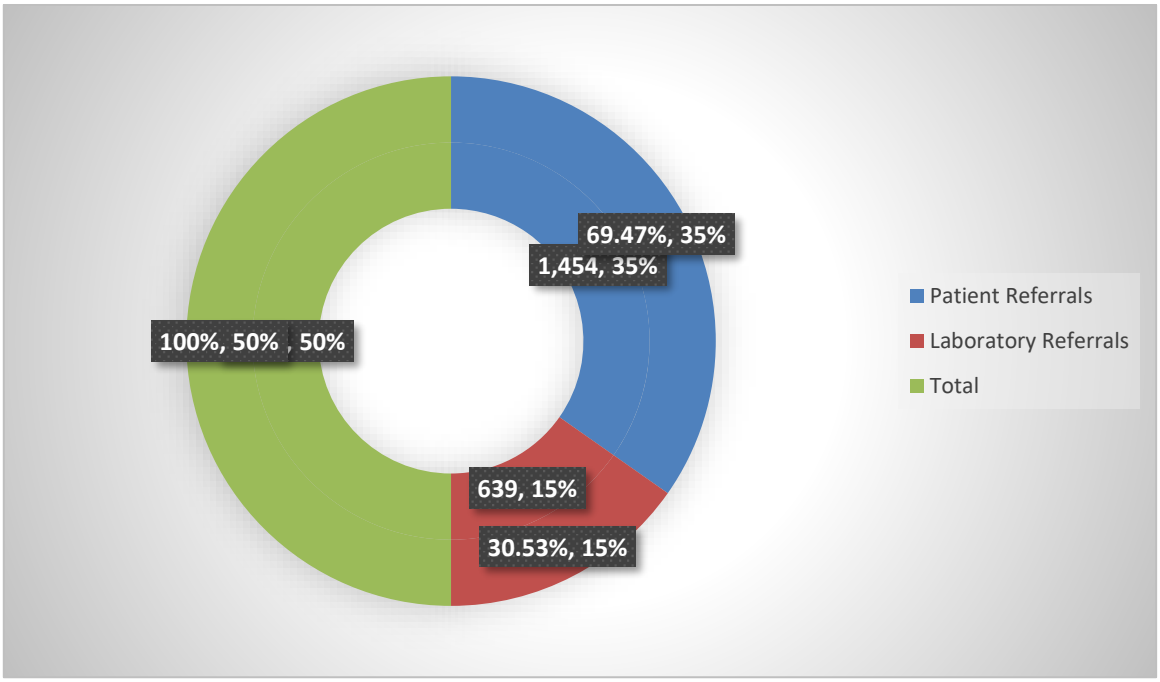
The analysis of system-generated data from the BGH-ORAS dashboard from July 16 to October 15, 2025, revealed the following:

- Total Referrals Processed: 2,093
- Patient Referrals: 1,454 (69.47%)
- Laboratory Referrals: 639 (30.53%)

These figures demonstrate the early adoption and operational integration of BGH-ORAS across multiple units in the hospital. A higher proportion of referrals were for clinical patient management, indicating that the system is successfully supporting core hospital functions such as outpatient, emergency, and ward-based care coordination. The laboratory referral volume reflects the digitization of diagnostic workflows—an important indicator of systems alignment.

2. **Referral Volume by Category (Figure 1)**

Figure 1. Distribution of referrals via BGH-ORAS (July–October 2025)



The data suggests that nearly 7 out of 10 referrals submitted through the system were directly related to patient care—highlighting the platform's immediate relevance to frontline clinical operations.

3. Qualitative Insights from Stakeholder Interviews

Thematic analysis of interviews with BGH staff, RHU users, and patients revealed five key themes:

a. Improved Inter-Island Coordination

Participants from remote municipalities such as Itbayat and Sabtang noted that BGH-ORAS enabled real-time coordination and case endorsement without requiring physical transport of documents.

"Before, we had to call BGH or send referral slips by boat. Now we just log in and refer, even during storms." – RHU Nurse, Itbayat

This aligns with prior studies emphasizing the role of digital systems in overcoming geographic fragmentation in island settings (Llave & Baggao, 2023).

b. Reduced OPD Congestion and Better Patient Flow

OPD staff reported decreased walk-in traffic and more predictable patient volumes. Scheduled appointments were more evenly distributed across the day, reducing crowding.

"We don't get overwhelmed in the mornings anymore. The appointments are now spread out." OPD Nurse, BGH

c. Enhanced Patient Satisfaction and Empowerment

Patients appreciated being able to choose dates and times that aligned with their availability and travel conditions. This increased autonomy contributed to a more patient-centered experience.

"I can book on my phone and just go when I'm sure I can come to Basco. That's a big help." – Patient from Mahatao

d. Technical Limitations and Connectivity Challenges

Some users reported difficulties accessing the system during poor signal conditions or power outages, particularly in more remote barangays.

"When the signal is weak, especially after a typhoon, we cannot access the portal." – Midwife, Sabtang

This confirms known limitations of digital health systems in GIDA areas (Robles & Gabriel, 2022; Ulep et al., 2021).

e. Need for Continuous Orientation and Feedback Mechanisms

Several interviewees expressed the need for refresher trainings, manuals, and a designated ORAS focal person to assist new users and resolve issues quickly.

Discussion

The preliminary evaluation of BGH-ORAS demonstrates significant operational benefits in the early phase of implementation. The system effectively addresses key logistical and clinical coordination challenges common in GIDA health systems. The 69.47% clinical referral rate is particularly notable, indicating that frontline services rely on the system not only for diagnostic but also for life-saving interventions.

Similar to findings by Zhou et al. (2020), the use of online appointment systems reduced unnecessary waiting and congestion, particularly in the OPD. The platform has also contributed to decentralizing the referral process, empowering both health professionals and patients to co-manage care.

However, persistent barriers remain. Infrastructure limitations—such as unstable internet in distant barangays—can interrupt access. This reinforces the need for hybrid models where manual and digital pathways coexist and for policies that invest in resilient rural health IT infrastructure.

The system's integration into BGH's Emergency Department (ED) and Ward Admissions also demonstrates that ORAS is not a stand-alone tool, but a digital backbone of coordinated care—critical in time-sensitive conditions such as trauma, obstetrics, and communicable disease referrals.

Conclusion

The implementation of the Batanes General Hospital Online Referral and Appointment System (BGH-ORAS) represents a significant leap forward in the digital transformation of healthcare delivery in one of the most geographically isolated provinces in the Philippines. In just three months since its launch, the system has processed over 2,000 referrals, with 69.47% for patient consultations and 30.53% for laboratory services, reflecting substantial integration into hospital operations. These early findings affirm that BGH-ORAS has contributed meaningfully to streamlining care coordination, reducing outpatient congestion, and improving the accessibility of health services for residents across Batanes' island municipalities.

Furthermore, the study reveals that BGH-ORAS functions not only as a technical system but also as a health equity tool—bridging time, distance, and resource limitations that have long hindered timely care in the region. By enabling remote booking and referral, the system empowers patients, supports continuity of care, and reduces administrative burdens on healthcare providers. The platform's success was particularly evident in enhancing inter-island collaboration, especially among RHUs in Sabtang, Itbayat, and Uyugan, and BGH departments like OPD, ER, and Laboratory.

Nonetheless, the study also identifies critical areas that require attention. Persistent issues related to internet connectivity, technical support, and digital literacy gaps were reported, especially by staff in remote areas. These concerns underscore the importance of embedding digital health within a broader ecosystem of infrastructure investment, policy alignment, and stakeholder engagement. The findings from this study also emphasize that digital tools, to be effective, must be context-responsive and community-centered—especially in geographically disadvantaged areas (GDAs).

Ultimately, BGH-ORAS is not only a product of innovation—it is a model of local resilience, policy adaptation, and health system modernization. It demonstrates how rural hospitals, even under extreme resource constraints, can lead meaningful change when digital solutions are properly designed, adequately supported, and collaboratively implemented.

Recommendations

Based on the findings and stakeholder feedback, the following recommendations are proposed to enhance the implementation and sustainability of BGH-ORAS:

1. **Strengthen System Infrastructure and Connectivity**
   - Improve internet stability in health facilities, particularly RHUs in outlying islands.
   - Explore options for offline functionalities and auto-sync features to mitigate service disruptions during power or network outages.
2. **Institutionalize Continuous Training and Support**
   - Conduct regular orientation sessions for RHU and BGH staff to ensure system literacy, especially for newly assigned personnel.
   - Develop step-by-step user manuals and video tutorials for both patients and providers.
   - Appoint a dedicated BGH-ORAS Focal Person for technical assistance and coordination with IT.
3. **Integrate Feedback Loops and Performance Monitoring**
   - Embed real-time feedback forms and periodic satisfaction surveys within the platform to assess user experience and functionality.
   - Establish key performance indicators (KPIs) such as referral turnaround time, no-show rate, and system downtime to support continuous quality improvement (CQI).
4. **Expand System Scope and Interoperability**
   - Extend the BGH-ORAS platform to cover additional services (e.g., radiology, pharmacy, and telemedicine).
   - Integrate BGH-ORAS with other digital platforms such as SegHIS, iHOMIS, or the PhilHealth Konsulta System for seamless health information exchange.
5. **Advocate for Policy Support and Scalability**
   - Share study results with DOH-Regional Office II, PhilHealth, and LGUs to secure technical and financial support for long-term system sustainability.
   - Encourage replication of the BGH-ORAS model in other GIDAs across the Philippines to fulfill national goals under Universal Health Care (UHC) and the National Digital Health Strategy (2020–2025).