

Beyond the Digital Front Door: An Equity Framework for Maintaining Access, Informed Choice, and Relational Continuity in Technology-Mediated Community Pharmacy Health Promotion

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Abstract

Digital technologies are reshaping how community pharmacies deliver health-promotion information, support preventive interventions, and maintain contact with patients. Although these arrangements may extend service availability, their equity implications depend on whether people with unequal digital resources can participate meaningfully, exercise informed choice, and sustain relationships with pharmacy professionals. This article develops an original non-empirical equity framework for technology-mediated community pharmacy health promotion through critical integration of pharmacy-service research, digital-health-equity literature, and scholarship on relational continuity. The analysis distinguishes service availability, practical accessibility, effective participation, informed choice, interpersonal continuity, and downstream health outcomes. It conceptualizes equitable access as a multi-path service arrangement in which digital, assisted, and non-digital participation remain workable alternatives, with clear responsibilities for maintaining continuity when patients move between routes. The framework assigns organizational significance to assistance, information transfer, route selection, and remediation when an intended service pathway becomes inaccessible. It also establishes an evaluation logic that separates digital uptake from meaningful service completion, freely selected participation, and continuity over time. Its contribution is conceptual and organizational; the complete framework has not undergone empirical validation. Community pharmacy digital transformation should be assessed through the opportunities it preserves for participation and ongoing care, including for people who cannot or choose not to use digital services.

Keywords: Community pharmacy, Digital health equity, Digital exclusion, Informed choice, Relational continuity, Health promotion

Introduction

Community pharmacies occupy an important position in public-health delivery because they offer opportunities for preventive advice, health promotion, and contact with people whose engagement with other healthcare services

may be intermittent. Evidence synthesized across community-pharmacy public-health interventions supports the relevance of this role while identifying limitations in the evaluation of population-level inequalities [1]. Digital technologies introduce additional service possibilities, including remote communication, virtual consultation, and technology-supported interactions [2]. Their introduction also changes the conditions under which people encounter pharmacy services, disclose concerns, and obtain professional assistance.

The availability of a digital service is an incomplete measure of access. An individual may encounter

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difficulties with connectivity, identification procedures, language, accessibility, or the practical requirements of using an application. Equitable access consequently depends on the relationship between technological arrangements and the circumstances of the people expected to use them [3]. Digital-health research further identifies the possibility that technological innovations reproduce or modify existing inequalities according to institutional design, implementation conditions, and the distribution of resources [4]. These considerations have particular significance for community pharmacy, where health-promotion activities may involve brief encounters, repeated informal contact, and participation outside a scheduled clinical appointment.

A service may achieve increased digital uptake while leaving important dimensions of participation unresolved. Individuals who complete an online interaction may have different opportunities to ask questions, understand recommendations, or return to a familiar pharmacist. Conversely, declining a digital option may represent an informed preference, a practical constraint, or an unsuccessful attempt to obtain assistance. These situations require different organizational responses.

This article develops an equity framework addressing how technology-mediated community pharmacy health promotion can preserve meaningful access, informed choice, personal continuity, and non-digital participation for people with unequal digital resources. Its conceptual contribution lies in treating service pathways, patient choice, and relationship preservation as interdependent organizational responsibilities. The analysis draws on empirical and conceptual literature without claiming that the resulting framework has been implemented or validated.

Digital transformation and the risk of exclusion in community pharmacy services

Digital transformation alters the organization of pharmacy services as well as their channels of communication. Electronic information systems, remote consultations, digital health-promotion materials, and patient-facing tools may change where an encounter begins, which information is available, and when professional interaction occurs. The consequences depend on the surrounding service arrangements.

Research examining e-pharmacy in Ghana illustrates how digitalization operates within existing infrastructural and socioeconomic conditions [5]. The implications of

this evidence are context-dependent: professional perspectives from one national setting cannot establish the distribution of access consequences across other health systems. Nevertheless, they direct attention to the resources that connect technological availability with actual service use.

Digital public-health messaging provides another example of the distinction between technological provision and meaningful participation. Research on digital screens in community pharmacies examines their use for public-health communication [6]. Such arrangements may create opportunities for information exposure, but exposure alone cannot demonstrate comprehension, personalized discussion, behavior change, or improvement in health. Health-promotion delivery therefore requires attention to the encounter that follows the initial presentation of information.

Patient-facing technologies may also reshape interactions with pharmacists. A pilot randomized study of a digital tool examined patient-pharmacist interaction within a community-pharmacy encounter [7]. This evidence provides a basis for considering how digital preparation of information can influence communication. Its limited setting and pilot design preclude treating the findings as proof of population-level equity. A systematic review of synchronous telepharmacy similarly identifies different models of remote pharmacist-patient care [8]. Their organizational differences matter because remote availability does not establish that each model provides equivalent opportunities for consultation, assistance, or continuing contact.

Infrastructure adds a further dimension. Research on electronic health records and e-prescribing in Australian community pharmacies identifies technological utilization as an operational issue within pharmacy practice [9]. Information systems can influence workflow and the availability of patient information, yet their use cannot independently establish whether patients understand their options or retain access to a familiar professional.

The central service-design problem concerns the relationship between digital entry and the continuation of care. A digital health-promotion message may lead to an assisted encounter, an in-person consultation, or a later return visit. If these opportunities are unavailable or difficult to navigate, the initial technological contact may have little practical value for the individual concerned.

For this reason, digital transformation must be examined through the full service arrangement: how participation

begins, where assistance is available, whether alternative routes remain usable, and how the pharmacy responds when a patient cannot complete the intended interaction.

Access, digital capability, and the conditions of meaningful participation

Access to technology-mediated pharmacy health promotion involves several distinguishable conditions. A service must be available, the individual must be able to reach it, and the arrangements must permit completion of the intended health-promotion activity. These conditions may depend on resources outside the individual's immediate control.

A framework for digital health equity identifies the need to consider technological participation within broader social and healthcare circumstances [10]. Qualitative evidence on advancing digital health equity reinforces the importance of understanding the experiences of people facing exclusion [11]. Applied to community pharmacy, these perspectives indicate that meaningful participation cannot be defined solely through possession of a device or registration with a service.

Digital capability is one relevant condition. A systematic review and meta-analysis identifies sociodemographic determinants associated with digital health literacy [12]. Such associations warrant attention to uneven opportunities for participation, but they do not justify inferring an individual patient's competence from age, education, or another demographic characteristic.

Capability also depends on the interaction between users and service arrangements. A qualitative meta-review examining research involving digitally marginalized groups illustrates how the organization of digital-health research and participation can itself shape inclusion [13]. This perspective challenges service designs that place the entire burden of successful participation on patients.

For example, a person may understand a health-promotion message but be unable to complete an

authentication procedure. Another may use a mobile application effectively while requiring a private consultation to discuss medication-related concerns. A third may need language assistance or an accessible presentation of information. These circumstances create different requirements for service support and cannot be resolved through a single measure of digital literacy.

Evidence concerning hospital patient portals identifies sociodemographic and socioeconomic differences in utilization [14]. Although hospital portals differ from community-pharmacy services, this literature illustrates why the existence of a digital service cannot be treated as evidence of equal participation. Research developing and validating a digital health literacy instrument for older adults also demonstrates the importance of explicitly defining the construct being measured [15]. Its measurement properties cannot be assumed to transfer unchanged to community-pharmacy health promotion.

For the present framework, meaningful participation refers to an individual's practical opportunity to complete the relevant health-promotion action with appropriate understanding and professional support. This definition does not prescribe a universal digital competence threshold. It requires the pharmacy to examine whether its own arrangements make the intended interaction workable.

The analytical distinction becomes particularly important where several obstacles coincide. Connectivity limitations may affect initial entry, while language barriers influence comprehension and staffing arrangements determine whether assistance is available. A successful login cannot establish that the subsequent encounter meets the person's needs.

Table 1 distinguishes conditions that may interrupt a pharmacy health-promotion encounter from the assistance required to preserve a workable route. The consequences concern service participation and should not be interpreted as measured effects on health.

Table 1. Conditions separating digital availability from a completed community-pharmacy health-promotion encounter

Exclusion condition	Affected pharmacy health-promotion action	Access-preserving support requirement	Consequence when support is unavailable
Unreliable connectivity or lack of a suitable device	Opening digital advice, contacting the pharmacy, or accessing follow-up information	A usable assisted or non-digital entry route	Technological availability does not translate into an opportunity to participate.
Difficulty navigating an interface or authentication procedure	Entering personal information or completing a service request	Accessible instructions and assistance with the relevant service action	An attempted encounter may remain incomplete despite initial access.

Language, sensory, or communication requirements	Understanding preventive advice and communicating individual concerns	Appropriate communication support and accessible information formats	Information may be received without enabling informed participation.
Limited privacy or unsuitable surroundings	Discussing sensitive health concerns or requesting personalized advice	A confidential interaction through a suitable service route	The available channel may be unsuitable for the intended consultation.
Incompatible service hours or unavailable assistance	Seeking clarification or progressing beyond general information	A reachable professional or workable alternative encounter	Initial contact may not lead to the required pharmacy interaction.
Difficulty returning after an interrupted digital encounter	Obtaining clarification, follow-up advice, or continuing support	Recognizable return arrangements and appropriate information continuity	A technically initiated service may remain fragmented or unfinished.

Note: This is a proposed analytical synthesis of access conditions and classification, estimated prevalence, or demonstrated intervention effect.

Meaningful participation consequently requires attention to both individual circumstances and the organization of support. An accessible service must provide a realistic opportunity to complete the intended interaction, including when the initially selected digital route proves unsuitable.

Informed choice and the preservation of non-digital alternatives

Informed choice introduces a requirement that cannot be resolved through accessibility alone. A person may be capable of using a digital service yet prefer face-to-face advice, printed information, or an assisted encounter. Another may accept a digital route because the available alternatives involve additional delay, expense, or practical difficulty. Whether participation reflects a meaningful choice depends partly on the options the service makes available.

A qualitative study of HealthEir examined the usability and acceptability of a blended model supporting brief interventions in community pharmacy [16]. Its relevance lies in the possibility of combining technological support with established pharmacy interactions. Acceptability findings, however, do not establish that patients possess an enforceable entitlement to every alternative mode of care.

Formative testing of a digital health kiosk with older adults offers further insight into the conditions surrounding technology use [17]. Interaction support and the immediate service environment may influence how a digital tool is experienced. Such evidence cautions against classifying people as either capable or incapable of participation without considering the assistance provided.

The present analysis distinguishes three service options: independent digital participation, assisted participation, and non-digital participation. These options identify

different organizational arrangements and are not intended to classify patients into fixed categories. Individuals may move between them according to the task, their circumstances, and their preferences.

Independent digital participation requires understandable information, usable service functions, and access to professional assistance when necessary. Assisted participation requires a support arrangement that allows the individual to remain meaningfully involved in the encounter. Non-digital participation requires a practical route through which the intended health-promotion service can still be requested or delivered.

Choice must also be considered over time. A protocol describing a digital health-supported community-pharmacy lifestyle intervention for adults with prediabetes establishes a planned intervention design, without providing completed intervention outcomes [18]. Research synthesizing inequalities across phases of mobile-health utilization further supports separating initial adoption from subsequent use [19]. These distinctions indicate that enrollment and continued participation should be evaluated separately from the circumstances under which an individual selects or changes a service route.

An equitable pharmacy arrangement should therefore permit reconsideration of an initial choice. A person who begins digitally may later require assistance, while someone who initially chooses an in-person encounter may elect to use digital follow-up. Neither movement should automatically be interpreted as failure, resistance, or diminished engagement.

Equity-oriented digital-health design literature offers approaches for incorporating the circumstances and experiences of diverse users into technological development [20]. For community pharmacy, the organizational implication extends beyond interface accessibility: patients need intelligible information about

available modes, realistic opportunities to select among them, and assistance when the selected route cannot support the intended interaction.

Confidentiality is integral to this requirement. Assisted digital participation must not presume that a patient is comfortable disclosing sensitive information to an intermediary. The relevant service arrangement should preserve an appropriate opportunity for direct and private professional communication.

A proposed choice safeguard is that the pharmacy makes the availability, practical conditions, and consequences of each participation route understandable before the individual commits to a mode. Where an alternative cannot be provided locally, the limitation should be recognized as a service constraint requiring an accountable response, not recast as the patient's preference.

This conceptual principle does not assert that a universal statutory right to every service mode already exists. Its purpose is to identify the service-design conditions necessary for meaningful choice and to distinguish them from simple acceptance of an available technology.

Relational continuity in technology-mediated pharmacy health promotion

Health-promotion encounters frequently extend beyond a single exchange of information. Patients may return for clarification, discuss changes in behavior or medication use, or seek advice from a pharmacist familiar with their circumstances. Technology-mediated arrangements can change how these encounters are connected.

A mixed-studies systematic review examining remote care and continuity in primary care identifies continuity as an important consideration in remote service provision [21]. A contemporary ontology of continuity in general practice further differentiates dimensions of continuity that can be affected by digitally mediated care [22]. These sources provide conceptual and empirical foundations for examining continuity in community pharmacy, although their findings cannot be assumed to apply identically across professional settings.

For the purposes of this framework, relational continuity concerns the opportunity to sustain a recognizable professional relationship across encounters. Informational continuity concerns the appropriate availability and transfer of relevant information. Organizational continuity concerns whether responsibility for the next necessary service action remains identifiable. These distinctions are applied

conceptually to pharmacy health promotion; they are not presented as a validated pharmacy-specific measurement instrument.

A digital encounter may preserve informational continuity through accessible records while altering the opportunity for interpersonal contact. Conversely, an in-person interaction may retain familiarity without ensuring that information from an earlier digital encounter is available. These possibilities demonstrate why continuity requires attention to both relationships and service coordination.

A systematic review of personal general-practitioner continuity reports relationships with healthcare outcomes in primary-care populations [23]. Its significance here is the recognition that ongoing professional relationships merit independent investigation. The findings do not establish equivalent effects for community pharmacy or permit the transfer of primary-care outcome estimates to pharmacist-patient relationships.

Access and continuity may also interact. A systematic review examining their relationship in primary healthcare highlights the need to assess both dimensions together [24]. For pharmacy health promotion, a convenient digital route may expand opportunities for contact while introducing changes in which professional responds, how previous concerns are communicated, and whether the patient can return to a familiar pharmacist. The consequences depend on the service model and the individual's circumstances.

A continuity-sensitive pharmacy service therefore requires identifiable arrangements for follow-up, appropriate information transfer, and opportunities for renewed professional contact. Where a patient changes from digital to assisted or non-digital participation, the transition should preserve relevant information without assuming that continuity of records alone substitutes for continuity of relationship.

Confidentiality presents an additional condition. Information transfer must remain appropriate to the service purpose and the individual's preferences. Assistance from pharmacy staff or another intermediary should not automatically broaden access to sensitive information beyond what is necessary for the encounter. The proposed relational requirement is that an individual should have a practical means of reconnecting with the pharmacy service after an initial encounter, including when the original technological route becomes inaccessible or unsuitable. This may involve returning to

a familiar pharmacist or receiving a clearly explained handoff within the pharmacy team.

The resulting analytical challenge is to preserve access and relationship quality simultaneously. Improved availability, service completion, and repeated use are distinct outcomes. Their relationship must be assessed through the actual organization of pharmacy care and cannot be inferred from technological participation alone.

Development of the equitable access and relational continuity framework

Existing digital-health-equity frameworks identify important social, technological, and organizational determinants of participation [25]. Evidence- and consensus-based framework development further establishes the relevance of institutional responsibilities to digital healthcare equity [26]. Community pharmacy requires an additional service-specific account of how these conditions operate when a health-promotion encounter moves between digital, assisted, and non-digital provision.

The Equitable Access and Relational Continuity Framework conceptualizes participation through three intersecting requirements: a workable route into the intended service, an informed opportunity to select or change that route, and preservation of relevant professional relationships across encounters. These requirements operate alongside individual resources, pharmacy capabilities, and wider institutional conditions. Their conjunction represents the article's proposed

synthesis, not an empirically established causal mechanism.

The framework distinguishes accessibility from effective participation. A digital route may be technically accessible without permitting completion of the intended pharmacy action. Similarly, service completion may occur through an arrangement the individual did not freely select. Relational continuity introduces a further dimension: a completed encounter may leave the patient without an identifiable opportunity for appropriate follow-up.

The three participation routes therefore have distinct operational requirements. Independent digital participation requires usable technology and reachable professional assistance. Assisted participation requires support that preserves patient involvement and confidentiality. Non-digital participation requires a practical alternative through which the relevant service remains obtainable. These routes may intersect or change during an encounter; they are not patient categories.

The proposed framework assigns particular significance to transitions. When an individual changes service mode, the pharmacy should preserve relevant information, identify responsibility for the next action, and maintain an appropriate opportunity for renewed professional contact. The availability of these safeguards is context-dependent and requires organizational support.

Figure 1 represents the resulting framework as an intersecting service-access field. It separates route availability, meaningful choice, effective participation, and continuity while retaining their cross-level relationships.

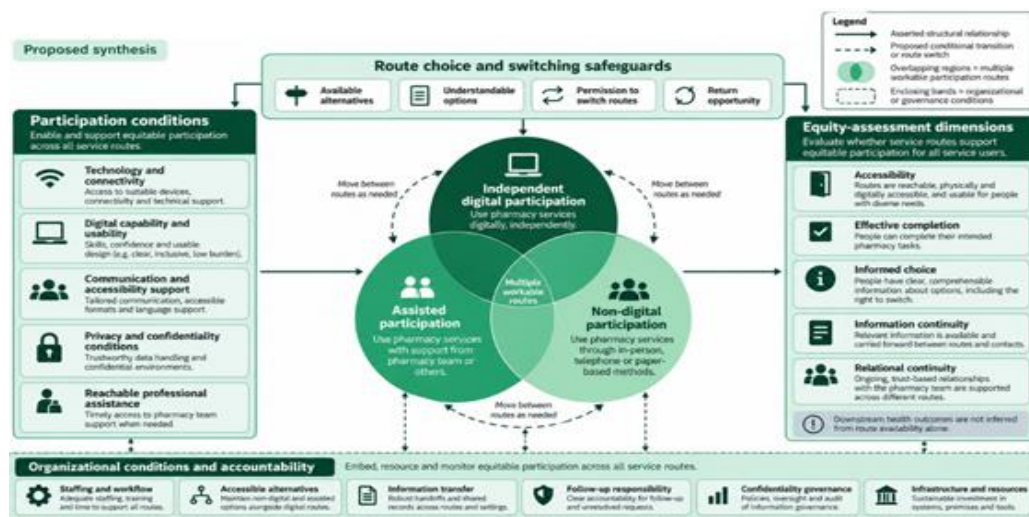


Figure 1. Equitable pharmacy participation across intersecting service routes

Organizational responsibilities and inclusive service design

Inclusive provision requires explicit responsibility for the conditions that allow patients to complete an encounter and return for subsequent support. A qualitative evaluation of a technology-assessment framework in community pharmacy demonstrates the relevance of assessing technological solutions within pharmacy practice [27]. Research on pharmacists' preparedness for interoperability and health informatics identifies workforce and technological considerations that also influence implementation [28].

Responsibility should be distributed according to the service action. Pharmacy staff require workable procedures for assisting patients and arranging follow-up. Pharmacy management must maintain the necessary staffing, accessible alternatives, and workflow arrangements. Technology providers are responsible for the functions they supply, while health-system organizations and relevant public authorities influence infrastructure, service specifications, and wider accessibility requirements.

A national survey examining pharmacists' views on addressing social determinants of health reinforces the need to consider professional capacity and organizational conditions [29]. Its findings concern reported views and cannot establish the outcomes of an implemented multi-path service.

A6 consequently proposes that route changes carry an identifiable responsibility for information transfer, appropriate professional contact, and resolution of incomplete encounters. A digital interaction should not become an organizational dead end when the individual requires assistance or elects another route.

These responsibilities must remain sensitive to confidentiality and local service capacity. An assisted encounter should preserve patient involvement, while a non-digital route should remain sufficiently functional to support the intended activity. Where resources prevent provision of an option, the limitation should be recognized and addressed through service planning.

The operational distinctions are set out in **Table 2**.

Table 2. Proposed organizational responsibilities for maintaining access and continuity across pharmacy service modes

Service route or transition	Continuity requirement	Responsible actor	Choice safeguard
Independent digital participation	Reachable clarification and follow-up	Pharmacy service manager and designated professional	Explain available assistance and alternative routes.
Assisted digital participation	Preserve patient involvement and relevant encounter information	Assisting staff and supervising pharmacist	Obtain appropriate permission and maintain confidentiality.
Non-digital participation	Maintain a workable route to the intended service	Pharmacy management and service team	Avoid making digital registration the sole practical entry condition.
Digital-to-assisted transfer	Carry forward necessary information and unresolved questions	Receiving pharmacy professional	Permit reconsideration of the original service mode.
Assisted-to-offline transfer	Preserve the intended health-promotion activity and follow-up opportunity	Designated pharmacist or service coordinator	Explain the available alternative without treating the transition as non-adherence.
Interrupted or incomplete encounter	Identify the outstanding action and appropriate return arrangement	Pharmacy team under organizational oversight	Provide a practical means of resuming participation.

Note: The responsibilities constitute proposed organizational design principles. Their implementation and enforceability depend on the applicable service arrangements, institutional responsibilities, and jurisdiction.

The relationship between these responsibilities is especially important when patients change service mode. **Figure 2** distinguishes the three parallel routes and their transfer opportunities while identifying points at which continuity can be lost.

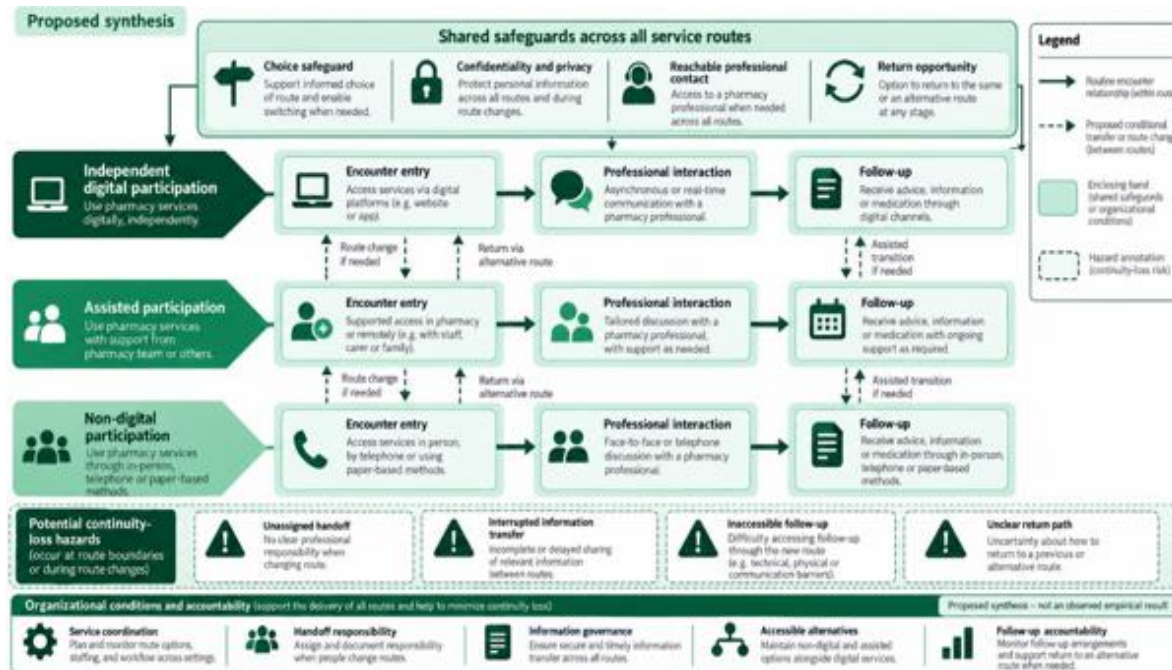


Figure 2. Pharmacy service pathways and the preservation of continuity during route changes

Evaluating equity beyond digital uptake and service utilization

Evaluation should distinguish the number of people using a digital service from the opportunities available to the population it is intended to serve. Community-pharmacy public-health evidence establishes the importance of examining inequalities as well as service outcomes [1]. Research on hospital portal use illustrates why measured utilization can differ between population groups [14], while mobile-health evidence supports consideration of inequalities across successive phases of participation [19].

A6 proposes separate assessment of accessibility, effective completion, informed choice, and relational continuity. The denominator for each indicator must correspond to its construct. For example, completed

digital encounters describe activity among participants, whereas equitable reach requires attention to the wider eligible population and, where ascertainable, unsuccessful attempts to access care.

Capability measures should be defined for the population and task being evaluated [12]. Existing measurement instruments may inform this work, but adaptation to community-pharmacy health promotion requires appropriate validation [15]. Continuity likewise requires measures beyond encounter frequency, including the availability of follow-up and relevant professional relationships [21].

Table 3 sets out proposed measurement distinctions. The indicators are intended for future evaluation; they are not a validated composite score or evidence of framework effectiveness.

Table 3. Proposed indicators distinguishing digital utilization from equitable pharmacy participation

Equity construct	Potential indicator	Meaningful denominator or comparison	Inference limit
Service accessibility	Opportunity to reach a workable participation route	Eligible service population, including people not using the digital channel	Digital registration alone cannot establish reach.
Effective participation	Completion of the intended health-promotion action	People attempting that action, with unsuccessful attempts recorded where feasible	Completion does not establish understanding or health benefit.

Informed choice	Reported availability and acceptability of participation alternatives	People offered the relevant service options	Selection does not independently establish freedom from practical pressure.
Relational continuity	Opportunity for recognizable professional follow-up	People requiring repeated contact or a route transition	Repeated encounters alone do not establish relationship quality.
Information continuity	Relevant information available following a service-mode change	Encounters requiring information transfer	Record availability does not establish interpersonal continuity.
Downstream health outcomes	Validated outcomes appropriate to the specific intervention	Relevant intervention population and comparator	Health effects cannot be inferred from uptake or the proposed framework.

Note: Indicators are proposed constructs for subsequent operationalization. No numerical threshold, weighting scheme, causal effect, or validated composite measure is asserted.

Implications for community pharmacy practice and public health policy

Practical implementation requires alignment between the intended health-promotion activity and the pharmacy's capacity to deliver it. Qualitative research on physical activity promotion identifies considerations surrounding the expansion of community-pharmacy health-promotion activities [30]. Such evidence supports attention to routine practice conditions without establishing the effectiveness of A6.

Pharmacies applying the framework would need to specify how patients enter services, obtain assistance, change participation mode, and reconnect after an interrupted encounter. Organizational planning should assign responsibility for these actions and identify resource constraints that make an advertised alternative impractical.

For public-health policy, the framework supports service specifications that distinguish digital availability from inclusive participation. Procurement, commissioning, and evaluation arrangements can address accessible alternatives, assistance, confidentiality, and continuity alongside utilization. The precise obligations depend on the applicable jurisdiction and service arrangements.

Future research should examine whether these provisions improve participation among differently situated populations, whether they preserve patient choice, and how their resource requirements affect implementation.

Results and Discussion

The framework contributes a pharmacy-specific account of equitable digital health promotion by joining service access, informed choice, and relational continuity within a multi-path arrangement. It offers an explanation of why digital uptake and completed encounters are insufficient substitutes for inclusive participation.

Its central proposition remains untested. Evidence supporting its component concepts comes from heterogeneous pharmacy, primary-care, and wider digital-health settings. Differences in service organization, population characteristics, intervention purpose, and measurement constrain transfer between contexts.

Several competing possibilities warrant investigation. Assisted participation may preserve access while increasing staffing demands. Non-digital provision may support individual preference but require resources that are unevenly available. Remote contact may improve convenience while altering opportunities for an ongoing professional relationship. Their consequences cannot be determined without examining actual service arrangements and patient experiences.

The framework also requires sensitivity to variation within population groups. Demographic characteristics should inform equity assessment without becoming substitutes for individual needs or preferences. Evaluation must distinguish voluntary route selection from constrained participation and account for people absent from digital utilization data.

Empirical development should therefore test the proposed constructs, examine pathway transitions, and investigate organizational feasibility across different community-pharmacy settings.

Conclusion

Equitable technology-mediated community pharmacy health promotion requires a workable opportunity to participate, informed choice among service routes, and appropriate continuity across encounters. Digital, assisted, and non-digital provision should be assessed as interconnected service arrangements with identifiable organizational responsibilities. The proposed framework offers a basis for examining access beyond technological

uptake while distinguishing service completion, choice, continuity, and health outcomes. Its practical value and effectiveness require prospective evaluation in community-pharmacy settings.

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