

Restoring trust: gratitude vs. apology in healthcare service recovery

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Abstract

Purpose – This study applies the Affect Theory of Social Exchange (ATSE) to examine how symbolic service recovery strategies, specifically apologies and gratitude expressions, influence patient empathy, forgiveness, and trust. It addresses the challenge of rebuilding trust following healthcare service failures through emotionally grounded mechanisms.

Design/methodology/approach – Five experimental studies ($N = 1,221$) were conducted to assess patients' emotional responses and behavioral intentions across varying levels of error severity, attribution, and history, as well as patient trait empathy.

Findings – Gratitude expressions elicited stronger patient empathy than apologies in isolated, low-severity errors, particularly among individuals with high trait empathy. In contrast, apologies were more effective in high-severity, system-attributed failures, where explicit acknowledgment of responsibility was expected.

Practical implications – The findings provide evidence-based guidance for tailoring recovery communications to the severity, attribution, and recurrence of errors, as well as to patients' empathy levels. Implementing these strategies can help healthcare organizations strengthen patient trust and promote more empathetic, relationship-centred care.

Originality/value – This research extends ATSE to healthcare service recovery by demonstrating how affective mechanisms drive trust restoration. It positions gratitude as an effective yet underused recovery strategy, offering theoretical clarity and practical relevance in contexts where providers may be constrained in offering apologies due to legal or reputational concerns.

Keywords Healthcare service, Symbolic service recovery strategies, Empathy, Forgiveness, Trust, Affect theory of social exchange

Paper type Research article

Introduction

Two recent incidents highlight the vulnerability in healthcare service delivery. In Japan, a family, including two young children, mistakenly received COVID-19 vaccines instead of flu shots [1]. In Taiwan, a patient underwent thoracic surgery intended for another due to a series of identification failures [2]. These incidents not only emphasize the potential for severe trust breaches in healthcare but also set the stage for examining the critical role of emotional responses in service recovery.

Understanding how patients emotionally respond to such failures requires moving beyond traditional models of service recovery. Most existing studies have conceptualized recovery as a cognitive process grounded in fairness evaluations (e.g. Maxham and Netemeyer, 2002; McColl-Kennedy and Sparks, 2003) or causal attributions (e.g. Iglesias, 2009; Van Vaerenbergh *et al.*, 2014). These frameworks, while powerful, view service recovery as a



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rational evaluation of fairness or responsibility, overlooking the emotional mechanisms through which relationships are repaired.

The Affect Theory of Social Exchange (ATSE) (Lawler, 2001) complements these perspectives by explaining how emotions generated during service encounters reinforce commitment and relational cohesion—mechanisms especially salient in healthcare, where emotional bonds are central to trust (Berry and Bendapudi, 2007; McColl-Kennedy *et al.*, 2017). Healthcare failures, in particular, evoke strong emotional reactions that cannot be fully explained by justice or attribution frameworks alone. Thus, ATSE offers a valuable yet underutilized lens to capture these affective responses.

This study addresses a key theoretical gap in service recovery research: the absence of a theory-grounded explanation of how service providers' symbolic recovery strategies, specifically apology and gratitude expressions, activate affective mechanisms that restore trust in healthcare. Although prior studies have shown that emotional responses drive post-recovery evaluations such as satisfaction and loyalty (Chebat and Slusarczyk, 2005; Valentini *et al.*, 2020), they have not clarified how distinct affective signals, such as apology and gratitude expressions, elicit these emotions under different conditions. Extending ATSE to this context enables examination of how enduring dispositions, particularly trait empathy, influence individual-level affective responses—an aspect not addressed in the original formulation of ATSE.

Apologies are considered effective at service recovery because they communicate responsibility and remorse (Davidow, 2003; Harrison-Walker, 2019; Radu *et al.*, 2019). Moreover, research indicates that they can diminish negative emotions, such as anger, thereby promoting forgiveness and facilitating trust repair (Fehr *et al.*, 2010; Frantz and Bennisson, 2005; Kim *et al.*, 2004). In healthcare, apologies not only acknowledge harm but also offer essential emotional support (Woods, 2007), helping rebuild trust by fostering empathy between patients and providers (Bismark, 2009). However, the effectiveness of alternative strategies, such as provider-initiated gratitude expressions, remains less explored.

Although less studied in healthcare, provider-initiated gratitude expressions (e.g. “thank you for your patience”) have been shown to enhance post-recovery satisfaction and loyalty in various service industries by acknowledging both the provider's responsibility and the customer's role in the recovery process, alleviating negative emotions, and fostering mutual respect and understanding (Ahmadi and Fakhimi, 2021; You *et al.*, 2020). Furthermore, gratitude promotes emotional reciprocity, which can deepen empathy by reinforcing a collaborative dynamic in social exchanges (Lawler, 2001). In this study, we define gratitude expressions as the provider's acknowledgment of the patient's cooperation or understanding following a service error, which is distinct from patient-expressed gratitude or general courtesy.

Prior work mostly examined gratitude as a patient-held emotion (e.g. Day *et al.*, 2020; Aparicio *et al.*, 2019) and empathy as a provider-expressed behavior (e.g. Nembhard *et al.*, 2023). However, limited attention has been paid to gratitude as a provider-initiated communication strategy or to how patients' trait and state empathy shape their responses to the provider's initial communication. Thus, our study examines how providers' initial communications, namely apology and gratitude expressions, interact with patient traits and situational factors to influence recovery outcomes. Initial communication refers to the first message initiated by the healthcare provider immediately upon discovering a service failure, marking the earliest emotional exchange between patient and provider in the recovery process. In this study, apology and gratitude expressions are conceptualized as symbolic recovery strategies enacted through the provider's initial communication.

Prior research also suggests that individual characteristics, such as narcissism, influence customers' responses to gratitude expressions following service failures (You *et al.*, 2020). However, the impact of individual factors such as patients' trait empathy on their reactions to apologies or gratitude expressions in healthcare remains underexplored. Contextual factors, including error severity, blame attribution, and whether errors are repeated or isolated,

significantly affect customer responses in service recovery (Bonifield and Cole, 2007; Weun *et al.*, 2004). Nonetheless, their specific influence in healthcare contexts is unclear.

To address these research gaps, we conducted five experimental studies with 1,221 participants. This multi-study design allows us to systematically examine the relative effectiveness of apology versus gratitude in healthcare service recovery and explore how individual (trait empathy) and contextual (error severity, error attribution, and error history) factors moderate these effects. For low-severity errors, gratitude outperforms apologies in fostering empathy, forgiveness, and trust. This is particularly true for individuals (patients) with high trait empathy or in cases of isolated errors. Conversely, apologies are more effective for high-severity errors attributed to system failures.

This study makes four significant contributions to the field of service recovery in healthcare. First, it extended ATSE by demonstrating that symbolic recovery strategies operate through affective, not purely cognitive, mechanisms in episodic service recovery encounters. Focusing on service recovery interactions, this study illustrates how affective processes shape trust restoration beyond ongoing relational exchanges. Second, the study identifies empathy as a core mediator linking affective communication to trust restoration, advancing understanding of the emotional mechanisms that rebuild trust in service recovery. Third, it defines boundary conditions for ATSE by incorporating individual (trait empathy) and contextual (error-related) moderators, thereby specifying when and for whom symbolic recovery strategies are most effective. Finally, the findings offer practical implications by presenting a theoretically grounded framework to guide healthcare providers in tailoring recovery communications.

Literature review and hypothesis development

Healthcare services: a unique context

Healthcare services, characterized by complex patient-provider interactions and high reliance on trust, significantly impact vulnerable patients' well-being (Berry and Bendapudi, 2007; Berry *et al.*, 2022; McColl-Kennedy *et al.*, 2017). Healthcare errors evoke intense emotional reactions, including stress, trauma, anger, fear, and betrayal, due to their life-altering outcomes and perceived compromises to safety or dignity (Berry *et al.*, 2015; Liukka *et al.*, 2020; Vincent and Amalberti, 2016). These emotions profoundly affect patients' trust in providers and shape their perceptions of the healthcare system (Liukka *et al.*, 2020; O'Connor *et al.*, 2010; Vincent and Amalberti, 2016).

Although negative emotions often dominate discussions of healthcare service failures, proactive and compassionate responses from providers, such as genuine apologies and demonstrated empathy, can improve patient experiences. Apologies have been found to alleviate emotional distress and support trust repair when perceived as sincere and timely in medical contexts (Gallagher *et al.*, 2003; Howley, 2009). Similarly, provider empathy contributes to patients' emotional relief and fosters forgiveness, particularly when patients perceive that their concerns are heard and understood (Nembhard *et al.*, 2023). While prior research highlights the value of these provider-initiated responses, less is known about how such symbolic strategies influence patients' own emotional responses, specifically, patient empathy and forgiveness, as mechanisms of trust restoration.

Service recovery in healthcare

Service recovery in healthcare is particularly challenging due to the high emotional engagement and trust required for effective care (Berry *et al.*, 2022; McColl-Kennedy *et al.*, 2017). These challenges highlight the need to explore effective recovery strategies. Symbolic recovery strategies, such as apologies and gratitude expressions, are particularly relevant because they directly address the emotional dimensions of healthcare service failures. Although effective, apologies often face resistance from healthcare providers due to legal concerns and fears of undermining their perceived competence (Gara, 2007; Howley, 2009).

Conversely, gratitude expressions, though effective in other service contexts (Grant and Gino, 2010), remain underexplored in healthcare and may offer a viable alternative with fewer legal risks and less concern about perceived competence. Despite their potential, there is a significant lack of comparative research on their effectiveness in healthcare, particularly in fostering patient empathy and rebuilding trust.

Application of affect theory of social exchange in healthcare service recovery

ATSE posits that emotions generated through social interactions regulate perceptions of relationship quality and shape subsequent behavioral intentions (Lawler, 2001). Its strength lies in explaining how affective experiences that go beyond cognitive evaluations of fairness or responsibility contribute to cooperation and trust. However, ATSE has been primarily developed in the context of recurring exchange relations among members of groups or organizations (Lawler, 2001; Lawler and Thye, 2006), and it pays limited attention to individual dispositions or situational contingencies that shape emotional reactions in service encounters. Applying ATSE to healthcare service recovery, therefore, requires specifying how the theory operates in episodic, high-stakes interactions, where emotional responses are shaped not only by exchange processes but also by provider communication and patient-level characteristics. By conceptualizing apology and gratitude as affective signals within this adapted framework, our study extends ATSE to explain how patient emotional responses, conditioned by trait empathy and contextual factors, shape forgiveness and trust repair between patients and healthcare providers.

Apologies (saying “sorry”). Gara (2007) advocates the use of apologies in healthcare, emphasizing their role in acknowledging responsibility for harm and in expressing remorse to patients when providers cause adverse outcomes. From the ATSE perspective, an apology could signal shared responsibility for the negative experience, potentially shifting the patient’s perception from the provider’s negligence to accountability. Supporting this theoretical perspective, Witvliet *et al.* (2020) research on victim-offender scenarios shows that apologies can foster appreciation, which in turn enhances prosocial behaviors such as empathy. However, further research is necessary to confirm these effects in healthcare contexts.

Gratitude expressions (saying “thank you”). Gratitude expressions, such as saying “thank you”, can serve as positive reciprocation in social exchange (Lawler, 2001), promoting prosocial behavior (Grant and Gino, 2010). Although counterintuitive, a service provider’s immediate “thank you” – for the customer’s patience and understanding in that tense moment – can reframe the situation, ease negative emotions, and set a more positive tone (Ahmadi and Fakhimi, 2021; You *et al.*, 2020). Drawing from ATSE (Lawler, 2001), this reframing emphasizes the patient’s engagement and the provider’s commitment to the relationship. According to the reciprocal principles (Lawler and Thye, 2006), such gratitude expression can foster shared positive emotions and enhance empathy. However, further research is needed to confirm how this process unfolds in healthcare contexts.

In summary, both apologies and gratitude expressions contribute to increased patient empathy after a service failure, operating through different emotional pathways: apologies by acknowledging responsibility and fostering appreciation, and gratitude expressions by reframing the situation and promoting positive reciprocal emotions. Whether to say *sorry* or *thank you* depends on the specific context of the service failure.

Apologies versus gratitude expressions. Recent studies have compared the effectiveness of gratitude expressions versus apologies as symbolic service recovery strategies across various contexts (see Table 1 for a summary of these studies). Gratitude expressions have been shown to enhance customer satisfaction more effectively than apologies by boosting self-esteem, promoting forgiveness, and ultimately fostering loyalty across various sectors (Ahmadi and Fakhimi, 2021; Lv *et al.*, 2022; You *et al.*, 2020). Prior research indicates that gratitude is particularly effective in less severe failures or when combined with significant utilitarian recovery (Kato *et al.*, 2021). However, Fang *et al.* (2021) found that apologies were more

Table 1. Summary of prior studies comparing apology and gratitude as service recovery strategies

| Author (Year) | Context | Theoretical/ conceptual frame | Moderators | Key findings | Relevance to the current study |
|----------------------------------|------------------------|--|--|--|--|
| <i>You et al. (2020)</i> | General services | Linguistic framing; self-verification theory | Consumer narcissism; timing of recovery | Appreciation consistently led to higher post-recovery satisfaction than apology, mediated by increased consumer self-esteem, even when combined with apology or utilitarian recovery. The effect depended on consumer narcissism and recovery timing | Highlights self-esteem as a key psychological mechanism for gratitude effectiveness. However, it lacks a healthcare context, emotional mediators (e.g. empathy), and contextual moderators such as error severity, error attribution, or error history |
| <i>Ahmadi and Fakhimi (2021)</i> | Restaurant and airline | Linguistic framing; self-esteem; emotional responses (forgiveness and anger) | Self-oriented perfectionism | Gratitude outperformed empathetic apology in enhancing post-recovery loyalty, mediated by increased forgiveness, reduced anger, and boosted self-esteem. This effect was stronger among consumers high in self-oriented perfectionism | Emphasizes affective mediators and self-esteem. However, it is situated in commercial contexts and does not consider situational moderators such as error history or error severity |
| <i>Kato et al. (2021)</i> | Online retail | Self-esteem; social exclusion | Service failure severity; amount of utilitarian recovery | Appreciation was more effective for minor failures, while apology was better for severe failures. Appreciation also outperformed apology when paired with large compensation; the reverse was true when compensation was small | Identifies boundary conditions for symbolic recovery (failure severity and compensation). However, it does not include trait-level moderators (e.g. trait empathy) or emotional mechanisms (e.g. forgiveness) |

(continued)

Table 1. Continued

| Author (Year) | Context | Theoretical/ conceptual frame | Moderators | Key findings | Relevance to the current study |
|---------------------------|------------------------------|--|--|---|--|
| Fang <i>et al.</i> (2021) | Hospitality | Message framing; self-enhancement motivation | Service provider gender; customer familiarity | Apology increased tipping behavior. Gratitude improved satisfaction when delivered by male staff and among highly familiar customers | Introduces social and interpersonal moderators (e.g. provider gender, consumer familiarity) and examines message framing effects. However, it focuses on tipping behavior rather than psychological outcomes, and does not address high-stakes healthcare contexts or emotional mediators (e.g. empathy) |
| Lv <i>et al.</i> (2022) | Tourism (AI service failure) | Need-threat model; relational and efficacy needs | Type of service failure (being rejected vs. ignored) | Gratitude (vs. apology) increased forgiveness when AI service failures involved rejection (vs. being ignored). Effects were mediated by relational vs. efficacy needs | Demonstrates context-dependent framing based on psychological needs, but focuses on non-human agents and lacks error attribution or emotion-based moderation relevant to healthcare |

Note(s): In this table, gratitude (or appreciation) refers to expressions of thanks (e.g. “thank you”), while apology refers to expressions of regret (e.g. “sorry”). Studies vary in terminology but generally examine these as symbolic service recovery strategies

Source(s): Authors’ own work

effective for minor failures, such as food delivery delays, due to consumer expectations for fault acknowledgment. Moreover, the effectiveness of these strategies depends on other contextual factors, such as relational familiarity (Fang *et al.*, 2021), as well as individual factors like narcissism (You *et al.*, 2020).

Despite these insights, applying them to healthcare, where service recovery involves higher stakes and unique relational dynamics (Berry *et al.*, 2015), requires further research. The emphasis on trust, empathy, and patient vulnerability in healthcare may influence the effectiveness of these strategies differently than in other services. Given the mixed findings in other sectors and the lack of theory-based predictions specific to the healthcare context, it is not justified to assume, without further investigation, that one strategy is more effective overall than the other. Therefore, we propose our first hypothesis to examine: 1) whether the emotional benefits of gratitude expressions extend to healthcare contexts, where trust and empathy are crucial, and 2) whether apologies play a more significant role in addressing perceived professional shortcomings.

H1. Gratitude expressions and apologies differ in effectiveness as symbolic service recovery strategies in healthcare to evoke patient empathy, foster forgiveness, and restore trust.

The central role of empathy in service recovery

Empathy plays a central role in the emotional dynamics of service recovery. It involves cognitive (understanding another's perspective) and affective (sharing another's emotions) components, both are essential for successful social interactions, facilitating deeper connections, trust-building, and conflict navigation (Davis, 1983; Wieseke et al., 2012). Research indicates that greater empathy toward the transgressor leads to increased forgiveness in service recovery contexts (Wei et al., 2020, 2022). Symbolic recovery strategies that focus on empathy often outperform economic strategies, such as compensation, in fostering forgiveness (Lajante and Remisch, 2023; Wei et al., 2020). These strategies reduce negative feelings toward the organization and encourage attributing failures to situational factors rather than malicious intent (Bove, 2019). This shift in attribution reduces blame and promotes a more forgiving response (Ndone, 2024; Zaki and Al-Romeedy, 2024).

Empathy thus acts as a bridge between symbolic service recovery and forgiveness, catalyzing emotional reconciliation and reducing anger (Bove, 2019; Wieseke et al., 2012). While prior studies consistently demonstrate empathy's key role in service recovery, they primarily focus on non-healthcare contexts. However, in healthcare, where patients are often at their most vulnerable, the role of empathy in service recovery may be even more critical (Berry et al., 2015). The unique nature of healthcare interactions, with their inherent power imbalances and high stakes, may influence how empathy functions in service recovery. A recent systematic review by Nembhard et al. (2023) emphasizes that empathy in healthcare is shaped by clinical, organizational, and relational factors that distinguish it from other service domains. This suggests that healthcare offers a distinct context in which to examine how empathy functions as a mechanism of trust repair. Given the central role of empathy in facilitating forgiveness, understanding how different symbolic recovery strategies evoke empathy is vital for effective healthcare service recovery. In this study, empathy is conceptualized as patients' empathic responses toward the healthcare provider, representing the collective actions and communications of its frontline employees. This conceptualization aligns with prior healthcare service research that treats the provider as a relational actor in trust-based exchanges with patients (Berry et al., 2021).

Forgiveness: a path to trust restoration

Forgiveness reduces negative feelings and behaviors toward an offender and increases positive emotions (Joireman et al., 2016; McCullough et al., 1998). In consumer-business interactions, it reflects customers' readiness to avoid retaliation and opt for constructive responses after a trust breach (Muhammad, 2019; Xie and Peng, 2009). As Fehr et al. (2010) observed in interpersonal contexts, forgiveness helps individuals overcome anger, resentment, and betrayal, facilitating reconciliation. This principle is crucial in healthcare service recovery, where unresolved negative emotions in such high-stakes environments can hinder the effectiveness of future care (Reynolds and Scott, 2000).

Empathy often mediates the pathway to forgiveness (Wei et al., 2020, 2022), as patients who recognize a provider's acknowledgment of harm and recovery efforts are more inclined to reconcile emotionally. Studies by Wieseke et al. (2012) and Bove (2019) show that customer empathy facilitates forgiveness following service failures, suggesting a similar mechanism may apply in healthcare. Bath and Bawa (2020) and Schumann and Dragotta (2021) further demonstrate the importance of empathy in mitigating negative emotions and promoting reconciliation. Therefore, symbolic recovery strategies that evoke empathy in healthcare consumers might facilitate forgiveness. However, further research is needed to confirm this inference in healthcare contexts. Therefore, we propose:

- H2. Patient empathy mediates the relationship between healthcare providers' symbolic recovery strategies (apologies and gratitude expressions) and patient forgiveness.

Trust restoration in healthcare service recovery

Trust is essential in relational exchanges, serving as “a mechanism for reducing social complexity” (Luhmann, 2018), by allowing individuals to act despite uncertainty about others’ intentions or future behavior. Trust involves a willingness to depend on a partner’s reliability and integrity (Sirdeshmukh *et al.*, 2002), incorporating both cognitive and emotional elements (Wang and Huff, 2007). In healthcare, trust is especially critical due to patients’ vulnerability and the high stakes associated with medical decisions (Berry and Bendapudi, 2007). It emphasizes the patient-provider relationship and is a primary goal of the service recovery effort (Berry *et al.*, 2022). Restoring trust ensures continuity of care and encourages patients to engage meaningfully with healthcare providers.

After a service failure, earning customer forgiveness is a key to rebuilding trust (Basso and Pizzutti, 2016; Xie and Peng, 2009). Forgiveness allows patients to release negative emotions like anger and resentment, creating the emotional space necessary for trust to rebuild (Wang and Huff, 2007). Without forgiveness, the relationship can remain strained, undermining the effectiveness of any recovery efforts (Xie and Peng, 2009).

In healthcare, symbolic recovery strategies such as apologies or gratitude expressions can evoke empathy and facilitate forgiveness, which is essential for trust restoration. Empathy helps patients understand the provider’s perspective, making forgiveness more likely and subsequently aiding trust restoration. Thus, we propose:

- H3.* Patient forgiveness mediates the relationship between patient empathy and trust restoration.

Moderating factors in healthcare service recovery

The following sections discuss several factors that influence the effectiveness of healthcare recovery strategies, focusing on trait empathy and contextual factors such as error history, attribution, and severity.

Trait empathy. Our earlier discussion focused on state empathy, a temporary mindset or emotional response shaped by situational factors and interpersonal cues (Nezlek *et al.*, 2007). In contrast, trait empathy refers to a stable, enduring disposition to experience empathy across various contexts (Schumann and Dragotta, 2021). This distinction is central to our framework, as we conceptualize state empathy as a mediator and trait empathy as a moderator that shapes how patients interpret recovery strategies. Prior research shows that trait empathy influences how individuals respond to interpersonal conflicts and service recovery efforts (Bove, 2019; Davidow, 2003; Schumann and Dragotta, 2021). However, how trait empathy shapes responses to specific service recovery strategies, such as apologies versus gratitude expressions, remains underexplored in healthcare interactions.

Drawing on interpersonal research, individuals high in trait empathy are more responsive to relational signals and expressions of warmth (Davis, 1983; Fehr *et al.*, 2010). Extending this logic to healthcare service failures, gratitude expressions that acknowledge the patient’s understanding or cooperation and signal relational intent beyond a purely professional role may resonate strongly with high-empathy patients, thereby amplifying their state empathy toward the provider. In contrast, patients low in trait empathy may be less responsive to subtle relational signals. For these individuals, a direct apology that explicitly acknowledges responsibility may facilitate empathic consideration even in the absence of a strong dispositional tendency. Thus, apologies may be less dependent on patients’ baseline empathy levels, whereas gratitude expressions may be especially effective among those high in trait empathy. Accordingly, we propose:

- H4.* Patient trait empathy moderates the relationship between recovery strategies and patient empathy, such that the positive effect of gratitude (vs. apologies) on patient empathy is stronger for patients with high (vs. low) trait empathy.

Error history. Error history, referring to a firm’s record of recurring service failures, significantly influences customer responses to recovery efforts (Maxham and Netemeyer, 2002).

When a service provider has a history of repeated failures, customers tend to be more skeptical of recovery attempts and may require more substantial efforts to restore their trust (Basso and Pizzutti, 2016). As the organization's errors recur, apologies might be perceived as insincere or insufficient, reducing their effectiveness (Maxham and Netemeyer, 2002). In healthcare, the effectiveness of apologies in eliciting patient empathy may vary with the error history. Patients may find it increasingly difficult to empathize with providers who repeatedly apologize for similar errors.

However, the impact of error history on the effectiveness of gratitude expressions is less clear. While gratitude expressions, focusing on acknowledging the patient's contribution and fostering mutual respect, may initially elicit empathy, their effectiveness could diminish as errors recur. Repeated errors may reduce patients' receptiveness to recovery strategies, diminishing their empathy toward healthcare providers. When a failure is isolated (no prior occurrences), patients are more likely to see it as a one-time aberration (unstable attribution) and may be open to relationship-repair efforts. In such cases, a gratitude expression that acknowledges the patient's patience can boost goodwill, potentially even more than an apology. Conversely, when similar errors have happened before (establishing a pattern, i.e. a stable problem), patients are less forgiving and may demand direct accountability; a simple "thank you" may not suffice in the face of eroded trust. This potential effect of error history on patient empathy highlights a gap in healthcare literature. Based on this understanding and the need for further research in this area, we propose:

- H5. Error history moderates the effectiveness of recovery strategies, such that gratitude expressions are more effective than apologies in fostering empathy when no prior similar errors have occurred. However, this advantage diminishes as similar errors recur.

Error attribution. Error attribution significantly affects customer satisfaction with recovery efforts in service failures (Iglesias, 2009; Van Vaerenbergh *et al.*, 2014). In healthcare, it influences patients' emotional responses and overall satisfaction with their provider (Walton and Hume, 2012). According to the Attributional Theory of Motivation and Emotion (Weiner, 1985), causal attributions shape emotional and behavioral responses. Typically, internally attributed failures such as human errors are judged more harshly than those attributed externally as system errors, which are perceived as process or operational breakdowns rather than deliberate individual mistakes (Forrester and Maute, 2015; Vakeel *et al.*, 2018; Walton and Hume, 2012).

While these studies were conducted in general service settings, the underlying attributional logic applies to healthcare, where patients distinguish between errors they primarily attribute to individual practitioners and those they attribute to the provider's systems or processes. Such distinctions are formed even when healthcare failures, whether low or high in severity, often involve a combination of human and system factors. Despite differences in healthcare systems' structures and accountability, patients' perceived attributions center on how the healthcare provider manages the initial communication following an error. Thus, the present theorizing concerns patient-provider interactions rather than sector-wide failures in national healthcare systems.

The effectiveness of recovery strategies in healthcare may depend on these attributions. Pace *et al.* (2010) suggest that apologies, which involve acknowledging responsibility, are most effective when errors are attributed to individual providers. Conversely, gratitude expressions, which shift focus to collaborative problem-solving, may be more appropriate for errors attributed to systems.

Although direct studies are limited, it is inferred that error attribution may influence patient empathy in healthcare. Errors primarily attributed to individual providers, by eliciting stronger negative emotions (Forrester and Maute, 2015), may reduce empathy as they create a sense of personal affront. Errors primarily attributed to system-level processes might foster empathy by removing direct blame from individuals and highlighting a sense of shared challenge. Thus, we propose:

- H6. Patients' attribution of responsibility moderates the relationship between recovery strategies and patient empathy, such that apologies are more effective when responsibility is primarily attributed to individual providers, whereas gratitude expressions are more effective when responsibility is primarily attributed to system-level processes.

Error severity. In healthcare, where errors range from minor to life-threatening, understanding how error severity interacts with recovery strategies is vital for effective service recoveries. Studies have consistently shown that the severity of a service failure impacts customers' responses to recovery efforts (Chang *et al.*, 2015; Hess, 2008; Tsarenko and Tojib, 2012; Weun *et al.*, 2004). Severe failures often lead to anger, diminished sense of control, and increased blame attribution toward the service provider (Chang *et al.*, 2015; Drewery and McCarville, 2022). ATSE (Lawler, 2001) helps explain how these emotional outcomes shape future interactions and influence customers' responses to recovery strategies. In cases of severe service failures, customers expect substantial recovery efforts, which may include heartfelt apologies (Chang *et al.*, 2015). Through ATSE (Lawler, 2001), we can understand that apologies might address strong negative emotions by acknowledging failure and accepting accountability, potentially restoring fairness and paving the way for empathy.

Conversely, gratitude expressions may suit low-severity situations (You *et al.*, 2020). According to ATSE, in these cases, gratitude expressions can foster positive emotions and reinforce the collaborative nature of healthcare interactions. For minor errors, people may find it easier to maintain empathy, and gratitude expressions could further enhance this by reinforcing the positive aspects of the relationship (Grant and Gino, 2010). However, in severe failure contexts, gratitude expressions may seem dismissive or misaligned with the emotional gravity of the situation (Kato *et al.*, 2021). While the relationship between error severity and patient empathy in healthcare remains understudied, we can infer from ATSE and existing research that severity likely influences a patient's capacity for empathy. Therefore, we propose:

- H7. Error severity moderates the relationship between recovery strategies and patient empathy, such that apologies are more effective for high-severity errors, whereas gratitude expressions are more effective for low-severity errors in fostering empathy.

Interaction of error severity and attribution. Building on our discussions of error severity and attribution, we explore their crucial interaction in healthcare contexts. High-severity errors typically elicit stronger negative emotions and require more substantial recovery efforts (Smith *et al.*, 1999). However, whether these errors are attributed to human factors or the system may moderate this effect. System-attributed errors, especially severe ones, might be perceived as less personally directed and more as a shared challenge. This perception can help evoke empathy when patients perceive the failure as arising from system errors, thereby reducing individual blame and focusing on collective responsibility.

Accordingly, apologies may be particularly effective for high-severity system-attributed errors, demonstrating the healthcare provider's recognition of the serious nature of the error while also acknowledging system errors involved. This approach may help patients separate their negative emotions about the error from their feelings toward the individual healthcare provider, potentially fostering empathy. Conversely, for low-severity errors attributed to individuals or the system, the emotional response may be milder, requiring less intensive emotional recovery efforts. In these cases, gratitude expression might be more effective, especially for system-attributed errors, reinforcing the positive aspects of the relationship.

- H8. For high-severity errors, apologies are more effective in fostering patient empathy when responsibility is primarily attributed to system-level processes. Conversely, for low-severity errors, gratitude expressions are more effective when responsibility is primarily attributed to system-level processes.

Research methods

This research develops an integrated model (Figure 1) based on ATSE to examine how healthcare service recovery strategies impact trust. We conducted five experimental studies to compare the effects of gratitude expressions versus apologies in healthcare service recovery across different conditions (Table A1). Each study tested a moderated mediation model, in which empathy mediates the relationship between recovery strategy and forgiveness and trust, with a contextual or individual factor serving as a moderator. Study 1 examined patients' trait empathy as a moderator. Study 2 tested error history. Study 3 focused on error attribution. Study 4 investigated error severity. Study 5 explored a combined condition of error severity and attribution. This multi-study approach enables a comprehensive understanding of how symbolic recovery strategies operate across different patient characteristics and service failure contexts.

General procedures

Participants were recruited via an online platform [3] that filtered out rapid responses. After being randomly assigned to conditions, they completed a survey questionnaire to earn LINE [4] point credits. Manipulation checks for recognizing service responses and specific error details excluded non-compliant entries from the analysis.

Table 2 illustrates sample sizes and power analyses for all studies, targeting medium-sized effects ($f = 0.25$, $\alpha = 0.05$, power = 0.80) with calculations via G*Power 3 (Faul et al., 2007), confirming sufficient power for main effects. Participants' demographic profiles are presented in Table 3. Besides, participants rated the realism of scenarios on a 7-point scale, with mean ratings consistently above 5.5, indicating high perceived realism.

Scenarios. Scenarios across all studies were based on actual incidents. The primary scenario described a low-severity vaccine error. Scenarios in Studies 4–5 presented a high-severity surgical mistake (details in the Appendix). In each scenario, the initial communication came from a healthcare professional with appropriate authority, reflecting realistic healthcare practices: a clinic physician for the vaccine error (low severity) and the hospital director for the surgical mistake (high severity).

Measures. The surveys across the five studies comprised three sections. However, the survey for Study 1 included an additional section where participants responded to a 7-item trait empathy scale adapted from McBane (1995). In the other four studies, participants began by reading their assigned scenario and completed manipulation checks to confirm they

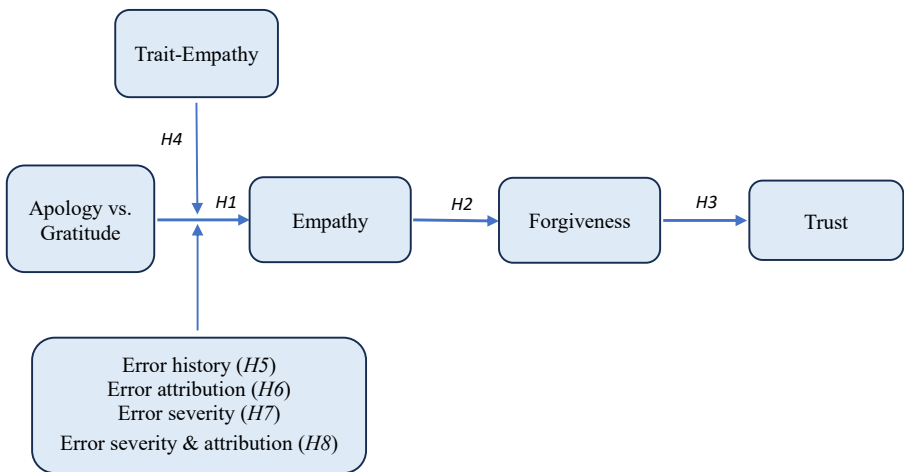


Figure 1. The research model. Source: Authors' own work

Table 2. Power analysis and sample sizes for Studies 1–5

| Study | Design | Required N | Actual N | Power for main effects |
|-------|-----------|------------|----------|------------------------|
| 1 | 2×2 | 128 | 146 | Sufficient |
| 2 | 2×2 | 128 | 142 | Sufficient |
| 3 | 2×2 | 128 | 237 | Exceeds required |
| 4 | 2×2 | 128 | 218 | Exceeds required |
| 5 | 2 × 2 × 2 | 128 | 478 | Exceeds required |

Source(s): Authors' own work

Table 3. Participants' profile

| Variable | Study 1 (n = 146) | Study 2 (n = 142) | Study 3 (n = 237) | Study 4 (n = 218) | Study 5 (n = 478) |
|------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| <i>Gender</i> | | | | | |
| Male | 57(39.0%) | 68(47.9%) | 99(41.8%) | 94(43.1%) | 212(44.3%) |
| Female | 89(61.0%) | 74(52.1%) | 138(58.2%) | 124(56.9%) | 266(55.7%) |
| <i>Age range</i> | | | | | |
| Age range | 21–61 | 21–73 | 20–80 | 20–80 | 20–80 |
| <i>Age average</i> | | | | | |
| Age average | 37.5 | 41.9 | 37.4 | 37.1 | 36.7 |
| <i>SD</i> | | | | | |
| SD | 8.86 | 12.22 | 9.20 | 9.49 | 9.57 |
| <i>Education</i> | | | | | |
| High school | 22(15.1%) | 21(14.8%) | 35(14.8%) | 37(17.0%) | 72(15.0%) |
| Bachelor's degree | 110(75.3%) | 90(63.4%) | 170(71.7%) | 147(67.4%) | 344(72.0%) |
| Graduate degree | 14(9.6%) | 31(21.8%) | 32(13.5%) | 34(15.6%) | 62(13.0%) |
| <i>Marriage status</i> | | | | | |
| Married | 70(48.0%) | 74(52.1%) | 118(49.8%) | 96(44.0%) | 211(44.2%) |
| Unmarried | 76(52.0%) | 57(40.1%) | 118(49.8%) | 122(56.0%) | 266(55.6%) |
| Other | 0(0.0%) | 11(7.8%) | 1(0.04%) | 0(0.0%) | 1(0.2%) |
| <i>Occupation</i> | | | | | |
| Employee (Public) | 14(9.6%) | 17(12.0%) | 28(11.81%) | 22(10.1%) | 48(10.0%) |
| Employee (Private) | 92(63.0%) | 74(52.1%) | 137(57.81%) | 139(63.8%) | 302(63.2%) |
| Employer | 34(23.3%) | 46(32.4%) | 64(27.0%) | 51(23.4%) | 111(23.2%) |
| Other | 6(4.1%) | 5(3.5%) | 8(3.38%) | 6(2.7%) | 17(3.6%) |

Source(s): Authors' own work

recognized and recalled the specific response and error details. The following section measured empathy (3 items, developed based on [Davis \(1983\)](#) and informed by [Bove \(2019\)](#), forgiveness (4 items, adapted from [Tsarenko and Tojib \(2012\)](#), and trust (5 items, developed based on [Sirdeshmukh et al. \(2002\)](#), and informed by [Kim et al. \(2009\)](#) and [Basso and Pizzutti \(2016\)](#), all using a 7-point Likert scale (see [Table 4](#)). The final section collected demographic data, including age, gender, marital status, and education.

Data quality, analyzed via Smart PLS 4.0, showed strong construct reliability and internal consistency (factor loadings >0.70, Cronbach's α > 0.70). Convergent and discriminant validity were confirmed by AVE values > 0.50 and appropriate [Fornell-Larcker criteria \(1981\)](#), respectively (see [Table 5](#)).

Study 1

Study 1 tested [H1–H4](#) using a 2×2 between-subjects design (recovery strategy: gratitude vs. apology; trait empathy: high vs. low) based on a scenario of a vaccine error (see [Appendix](#)). The study included 146 participants (61% female, detailed demographics in [Table 2](#)).

Table 4. Scale items and confirmatory factor analysis (Studies 1–5)

| Variables | Factor loading | | | | |
|---|----------------|---------|---------|---------|---------|
| | Study 1 | Study 2 | Study 3 | Study 4 | Study 5 |
| <i>Empathy</i> | | | | | |
| I sympathize with the mistakes that occurred at the clinic | 0.924 | 0.821 | 0.849 | 0.867 | 0.864 |
| The efforts made by the clinic to correct the mistake are commendable | 0.865 | 0.727 | 0.825 | 0.780 | 0.745 |
| I feel the clinic’s situation is unfortunate and should not be judged harshly | 0.908 | 0.730 | 0.837 | 0.871 | 0.832 |
| <i>Forgiveness</i> | | | | | |
| I am willing to overlook this mistake and move forward | 0.823 | 0.794 | 0.853 | 0.848 | 0.848 |
| I do not hold lasting resentment toward the clinic for this mistake | 0.882 | 0.835 | 0.878 | 0.825 | 0.844 |
| I believe that despite the mistake, I would be willing to give the clinic another chance | 0.825 | 0.830 | 0.881 | 0.799 | 0.878 |
| I am ready to let go of any negative emotions caused by this mistake | 0.865 | 0.801 | 0.797 | 0.857 | 0.833 |
| <i>Trust</i> | | | | | |
| Despite the mistake, I still believe the clinic is reliable | 0.858 | 0.873 | 0.867 | 0.850 | 0.881 |
| I am confident in the clinic’s ability to prevent similar mistakes in the future | 0.886 | 0.889 | 0.864 | 0.863 | 0.860 |
| After the clinic’s response to this incident, my confidence in their abilities has been restored | 0.897 | 0.906 | 0.873 | 0.857 | 0.872 |
| I believe the clinic is committed to maintaining high standards of medical service to prevent future mistakes | 0.857 | 0.792 | 0.867 | 0.820 | 0.753 |
| The actions taken by the clinic to address the mistake have strengthened my trust in their services | 0.724 | 0.828 | 0.827 | 0.814 | 0.758 |
| <i>Tait-empathy</i> | | | | | |
| I often naturally care about people who are less fortunate than me | 0.717 | | | | |
| I usually find it easy to step into someone else’s shoes and see things from their perspective | 0.687 | | | | |
| I feel protective of people when I see them being taken advantage of | 0.764 | | | | |
| I am often moved by things that happen to other people | 0.725 | | | | |
| When others feel upset or distressed, I try to understand what causes their feelings | 0.769 | | | | |
| When I see someone in a difficult situation, I actively try to help them, even if I don’t know them well | 0.692 | | | | |
| Seeing others in pain makes me feel anxious or uncomfortable | 0.780 | | | | |
| Note(s): All items use a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree) | | | | | |
| Source(s): Authors’ own work | | | | | |

Hypothesis testing. Three independent *t*-tests indicated significantly a higher level of empathy, forgiveness, and trust in the gratitude expression condition compared to the apology condition (empathy: $M_{\text{gratitude}} = 4.84$ vs. $M_{\text{apology}} = 4.42$, $t(144) = 2.03$, $p < 0.05$; forgiveness: $M_{\text{gratitude}} = 4.61$ vs. $M_{\text{apology}} = 4.06$, $t(144) = 2.88$, $p < 0.01$; trust: $M_{\text{gratitude}} = 4.85$ vs. $M_{\text{apology}} = 4.46$, $t(144) = 2.17$, $p < 0.05$). These findings supported H1.

To test H2 and H3, a PROCESS Model 6 analysis (10,000 bootstrapping samples, 95% confidence interval) was conducted to evaluate the proposed model. In this model, the recovery strategy served as the independent variable (X), empathy (M_1) and forgiveness (M_2) acted as mediators, and trust was the dependent variable (Y).

Table 5. Descriptive statistics, reliability, validity, and correlations of variables (Studies 1–5)

| Variables | M | SD | CR | AVE | α | Square root of the AVE and correlations* | | |
|----------------|-------|-------|-------|-------|----------|--|-------|-------|
| | | | | | | 1 | 2 | 3 |
| <i>Study 1</i> | | | | | | | | |
| 1. Empathy | 4.635 | 1.241 | 0.886 | 0.808 | 0.881 | 0.899 | | |
| 2. Forgiveness | 4.343 | 1.202 | 0.877 | 0.721 | 0.871 | 0.811 | 0.849 | |
| 3. Trust | 4.659 | 1.083 | 0.907 | 0.717 | 0.900 | 0.846 | 0.817 | 0.847 |
| <i>Study 2</i> | | | | | | | | |
| 1. Empathy | 3.545 | 1.121 | 0.804 | 0.579 | 0.746 | 0.761 | | |
| 2. Forgiveness | 3.759 | 1.157 | 0.888 | 0.665 | 0.865 | 0.663 | 0.815 | |
| 3. Trust | 3.959 | 1.242 | 0.933 | 0.737 | 0.949 | 0.672 | 0.702 | 0.859 |
| <i>Study 3</i> | | | | | | | | |
| 1. Empathy | 4.511 | 1.240 | 0.876 | 0.701 | 0.787 | 0.837 | | |
| 2. Forgiveness | 4.658 | 1.140 | 0.914 | 0.728 | 0.875 | 0.824 | 0.853 | |
| 3. Trust | 4.769 | 1.148 | 0.934 | 0.739 | 0.912 | 0.792 | 0.851 | 0.860 |
| <i>Study 4</i> | | | | | | | | |
| 1. Empathy | 3.121 | 0.858 | 0.878 | 0.706 | 0.791 | 0.841 | | |
| 2. Forgiveness | 3.219 | 0.840 | 0.900 | 0.693 | 0.852 | 0.829 | 0.833 | |
| 3. Trust | 3.381 | 0.780 | 0.923 | 0.707 | 0.897 | 0.745 | 0.785 | 0.841 |
| <i>Study 5</i> | | | | | | | | |
| 1. Empathy | 4.204 | 1.130 | 0.855 | 0.664 | 0.745 | 0.815 | | |
| 2. Forgiveness | 4.143 | 1.212 | 0.913 | 0.724 | 0.873 | 0.790 | 0.851 | |
| 3. Trust | 4.442 | 1.099 | 0.915 | 0.683 | 0.883 | 0.799 | 0.826 | 0.827 |

Note(s): CR = composite reliability, AVE = average variance extracted, α = Cronbach's alpha. *The values in diagonal cells are the square root of the AVE for each variable; correlations are reported below the diagonal

Source(s): Authors' own work

The results, summarized in [Table 6](#), revealed significant findings. The direct effect of the recovery strategy on trust was not significant ($\beta = -0.000$, $SE = 0.091$; $t = -0.001$, $p > 0.1$, 95% CI $[-0.179, 0.179]$). However, two indirect effects were significant: Ind1 ($\beta = 0.197$, $SE = 0.106$, 95% CI $[0.012, 0.415]$) and Ind 3 ($\beta = 0.106$, $SE = 0.066$, 95% CI $[0.005, 0.268]$). In contrast, Ind2 was insignificant ($\beta = 0.081$, $SE = 0.044$, 95% CI $[-0.004, 0.171]$). These results suggest that recovery strategies influence trust through two distinct pathways. The first pathway, Ind1 (recovery strategies \rightarrow empathy \rightarrow trust), demonstrates that empathy alone can mediate trust restoration, highlighting the direct role of empathy in restoring trust. The second pathway, Ind3 (recovery strategies \rightarrow empathy \rightarrow forgiveness \rightarrow trust), confirms the sequential mediation of empathy and forgiveness, thereby supporting [H2](#) and [H3](#).

To test [H4](#), PROCESS Model 1 analysis (10,000 bootstrapping samples, 95% confidence interval) was conducted. The results showed that trait empathy significantly moderates the impact of the recovery strategy on empathy ($\beta = 0.647$, $SE = 0.255$; $t = 2.534$, $p < 0.05$, 95% CI $[0.142, 1.152]$). Participants with high trait empathy in the gratitude expression condition reported a significantly higher level of empathy compared to those in the apology condition ($\beta = 0.854$, $SE = 0.248$; $t = 3.433$, $p < 0.01$, 95% CI $[0.362, 1.345]$). However, no significant differences were observed between the two recovery strategies for those with low trait empathy ($\beta = -0.023$, $SE = 0.257$; $t = -0.090$, $p = 0.929$, 95% CI $[-0.531, 0.485]$) ([Figure 2](#)). These findings confirm that gratitude expressions are more effective at patient empathy for those with high trait empathy. However, there is no significant difference among those with low trait empathy, thus partially supporting [H4](#).

Table 6. Path analyses for indirect effects (Studies 1–5)

| | Effect | SE | BootLL CI | BootUL CI |
|--|--------|-------|--------------|--------------|
| <i>Pathways (Study 1)</i> | | | | |
| Total effect | 0.383 | 0.177 | 0.034 | 0.733 |
| Direct effect: Recovery strategy → trust | −0.000 | 0.091 | −0.179 | 0.179 |
| Indirect effect | 0.383 | 0.163 | 0.079 | 0.717 |
| Ind1 Recovery strategy → empathy → trust | 0.197 | 0.106 | 0.012 | 0.415 |
| Ind2 Recovery strategy → forgiveness → trust | 0.081 | 0.044 | −0.004 | 0.171 |
| Ind3 Recovery strategy → empathy → forgiveness → trust | 0.106 | 0.066 | 0.005 | 0.268 |
| <i>Pathways (Study 2)</i> | | | | |
| Total effect | 0.430 | 0.206 | 0.023 | 0.837 |
| Direct effect: Recovery strategy → trust | −0.083 | 0.148 | −0.377 | 0.210 |
| Indirect effect | 0.513 | 0.148 | 0.207 | 0.799 |
| Ind1 Recovery strategy → empathy → trust | 0.278 | 0.100 | 0.104 | 0.498 |
| Ind2 Recovery strategy → forgiveness → trust | 0.002 | 0.071 | −0.147 | 0.136 |
| Ind3 Recovery strategy → empathy → forgiveness → trust | 0.233 | 0.072 | 0.104 | 0.385 |
| <i>Pathways (Study 3)</i> | | | | |
| Total effect | 0.302 | 0.148 | 0.594 | 0.263 |
| Direct effect: Recovery strategy → trust | 0.029 | 0.081 | −0.130 | 0.188 |
| Indirect effect | 0.273 | 0.125 | 0.029 | 0.521 |
| Ind1 Recovery strategy → empathy → trust | 0.082 | 0.052 | 0.004 | 0.204 |
| Ind2 Recovery strategy → forgiveness → trust | 0.030 | 0.050 | −0.069 | 0.127 |
| Ind3 Recovery strategy → empathy → forgiveness → trust | 0.161 | 0.079 | 0.013 | 0.322 |
| <i>Pathways (Study 4: high severity)</i> | | | | |
| Total effect | −0.469 | 0.158 | −0.781 | −0.156 |
| Direct effect: Recovery strategy → trust | 0.038 | 0.091 | −0.143 | 0.219 |
| Indirect effect | −0.507 | 0.133 | −0.772 | −0.249 |
| Ind1 Recovery strategy → empathy → trust | −0.164 | 0.087 | −0.370 | −0.034 |
| Ind2 Recovery strategy → forgiveness → trust | −0.115 | 0.060 | −0.250 | −0.018 |
| Ind3 Recovery strategy → empathy → forgiveness → trust | −0.228 | 0.084 | −0.408 | −0.077 |
| <i>Pathways (Study 4: low severity)</i> | | | | |
| Total effect | 0.278 | 0.121 | 0.038 | 0.519 |
| Direct effect: Recovery strategy → trust | 0.143 | 0.102 | −0.059 | 0.345 |
| Indirect effect | 0.135 | 0.800 | 0.003 | 0.316 |
| Ind1 Recovery strategy → empathy → trust | 0.052 | 0.037 | 0.000 | 0.136 |
| Ind2 Recovery strategy → forgiveness → trust | 0.022 | 0.042 | −0.040 | 0.127 |
| Ind3 Recovery strategy → empathy → forgiveness → trust | 0.061 | 0.046 | 0.001 | 0.173 |
| <i>Pathways (Study 5: high severity)</i> | | | | |
| Total effect | −0.508 | 0.150 | −0.803 | −0.214 |
| Direct effect: Recovery strategy → trust | 0.039 | 0.083 | −0.125 | 0.203 |
| Indirect effect | −0.547 | 0.131 | −0.810 | −0.290 |
| Ind1 Recovery strategy → empathy → trust | −0.215 | 0.074 | −0.373 | −0.084 |
| Ind2 Recovery strategy → forgiveness → trust | −0.119 | 0.048 | −0.218 | −0.028 |
| Ind3 Recovery strategy → empathy → forgiveness → trust | −0.214 | 0.069 | −0.362 | −0.091 |
| <i>Pathways (Study 5: low severity)</i> | | | | |
| Total effect | 0.290 | 0.124 | 0.020 | 0.046 |
| Direct effect: Recovery strategy → trust | 0.036 | 0.067 | −0.97 | 0.168 |
| Indirect effect | 0.254 | 0.105 | 0.051 | 0.459 |
| Ind1 Recovery strategy → empathy → trust | 0.118 | 0.050 | 0.024 | 0.219 |
| Ind2 Recovery strategy → forgiveness → trust | 0.023 | 0.048 | −0.074 | 0.116 |
| Ind3 Recovery strategy → empathy → forgiveness → trust | 0.113 | 0.050 | 0.023 | 0.220 |

Source(s): Authors' own work

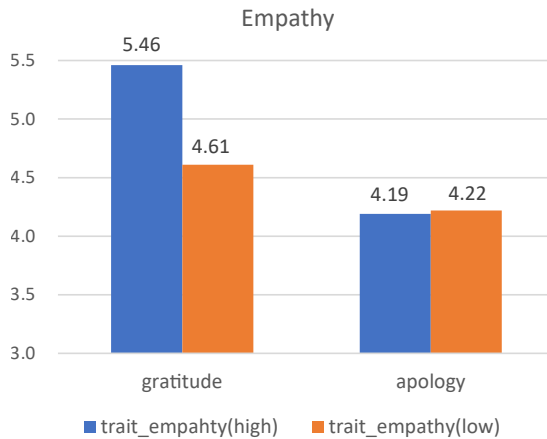


Figure 2. The interaction effect of recovery strategies and individual trait empathy on empathy (Study 1). Source: Authors' own work

Study 2

Study 2 employed a 2×2 between-subjects design with recovery strategy (gratitude expression vs. apology) and error history (yes vs. no) as factors. The recovery strategy scenarios are replicated from Study 1. Error history was manipulated by either disclosing a similar past incident (coded as “yes”) or stating no similar errors had occurred (coded as “no”). The study included 142 participants (52.1% female; see Table 2).

Hypothesis testing. Study 2 retested H2 and H3 to confirm the robustness of the mediation pathways identified in Study 1. As detailed in Table 6, Ind1 reaffirms empathy’s direct role in trust restoration, and Ind3 supports H2 and H3 again by confirming the sequential mediation of empathy and forgiveness.

To test H5, a two-way ANCOVA was conducted with recovery strategy and error history as independent variables, empathy as the dependent variable, and gender, age, education, and marital status as covariates. The results showed that error history significantly moderates the effect of the recovery strategy on empathy ($F(1, 134) = 18.04, p < 0.01$). When no prior error existed, participants in the gratitude expression condition reported significantly higher empathy than those in the apology condition ($M_{\text{gratitude}} = 4.40, SE = 0.83$ vs. $M_{\text{apology}} = 3.05, SE = 1.15; t(140) = 5.88, p < 0.01$). However, if it is a recurring error, no significant differences were observed between the two recovery strategies ($M_{\text{gratitude}} = 3.37, SE = 0.91$ vs. $M_{\text{apology}} = 3.29, SE = 1.07; t(140) = -0.33, p > 0.1$) (Figure 3). These findings confirm H5, demonstrating that gratitude expressions are more effective than apologies in fostering empathy when there are no prior errors, but this advantage diminishes when similar errors recur.

Study 3

Study 3 utilized a 2×2 between-subjects design with recovery strategy (gratitude expression vs. apology) and error attribution (human error vs. system error) as factors. The scenarios were identical to those in Studies 1 and 2, with error attribution manipulated through two conditions: “nurse’s negligence” (human error) or “a glitch in the vaccine registration system” (system error). This study included 237 participants (58.2% female; see Table 2).

Hypothesis testing. The mediation pathways were retested, with results presented in Table 6. H2 and H3 were confirmed again, demonstrating the consistency of these mediation effects across studies. To test H6, a two-way ANCOVA was conducted with recovery strategy and error attribution as independent variables and empathy as the dependent variable, and

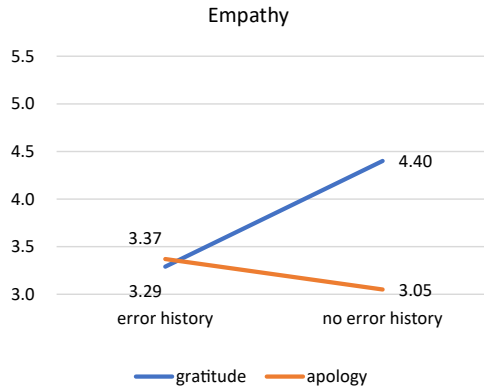


Figure 3. The interaction effect of recovery strategies and error history on empathy (Study 2). Source: Authors' own work

gender, age, education, and marital status as covariates. Participants in the gratitude expression condition reported significantly higher empathy than those in the apology condition ($M_{\text{gratitude}} = 4.68, SE = 1.18$ vs. $M_{\text{apology}} = 4.34, SE = 1.28; F(1, 229) = 5.04, p < 0.05$). Moreover, participants in the human error condition reported significantly higher empathy than those in the system error condition ($M_{\text{human error}} = 4.74, SE = 1.18$ vs. $M_{\text{system error}} = 4.26, SE = 1.26; F(1, 229) = 9.21, p < 0.01$). However, error attribution did not moderate the effect of the recovery strategies on empathy ($F(1, 229) = 0.093, p = 0.760$) (Figure 4). These findings indicate that H6 was not supported. Also, both apologies and gratitude expressions are more effective for errors attributed to humans.

Study 4

Study 4 conducted a 2×2 between-subjects design with recovery strategy (gratitude expression vs. apology) and error severity (high vs. low) as factors. The recovery strategy scenarios were consistent with the previous experiments, while error severity was manipulated through two conditions: a “wrong surgery” as a high-severity error vs. a “wrong vaccine” as a low-severity error. The study included 218 participants (56.9% female; see Table 2).

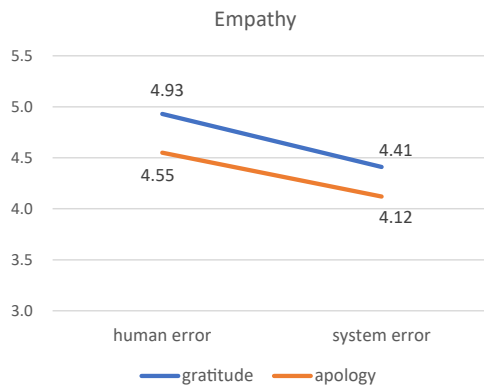


Figure 4. The interaction effect of recovery strategies and error attribution on empathy (Study 3). Source: Authors own work

Participants in the wrong surgery condition perceived significantly higher severity than those in the wrong vaccine condition ($M_{\text{surgery error}} = 5.97$, $SE = 1.17$ vs. $M_{\text{vaccine error}} = 5.53$, $SE = 1.17$, $t(216) = 2.72$, $p < 0.01$), confirming the success of the manipulation.

Hypothesis testing. As consistent with previous studies, Table 6 shows that Ind3 was significant in both high and low-severity conditions, confirming H2 and H3 again. However, Ind2 was significant only in high-severity conditions ($\beta = -0.115$, $SE = 0.060$, 95% CI $[-0.250, -0.018]$), indicating a substantial role of forgiveness in trust restoration during more severe incidents.

To test H7, a two-way ANCOVA was conducted with recovery strategy and error severity as independent variables, empathy as the dependent variable, and gender, age, education, and marital status as covariates. Error severity moderated the impact of the recovery strategy on empathy ($F(1, 210) = 12.83$, $p < 0.01$). For high-severity error, participants in the gratitude expression condition evoked significantly lower empathy than those in the apology condition ($M_{\text{gratitude}} = 2.62$, $SE = 0.83$ vs. $M_{\text{apology}} = 3.14$, $SE = 0.96$, $t(113) = -3.12$, $p < 0.01$). For low-severity error, participants in the gratitude condition evoked significantly higher empathy than those in the apology condition ($M_{\text{gratitude}} = 3.51$, $SE = 0.59$ vs. $M_{\text{apology}} = 3.26$, $SE = 0.74$, $t(101) = 1.88$, $p < 0.01$). (Figure 5). These findings support H7, showing that apologies are more effective for high-severity errors, whereas gratitude expressions are more effective for low-severity errors in fostering empathy.

Study 5

Study 5 applied a $2 \times 2 \times 2$ between-subjects design with recovery strategy (gratitude expression vs. apology), error attribution (human error vs. system error), and error severity (high vs. low) as factors. The scenarios were consistent with earlier studies. Study 5 included 478 participants (55.7% female; see Table 3). Participants in the wrong surgery condition perceived significantly higher severity than those in the wrong vaccine condition ($M_{\text{high-severity}} = 6.01$, $SE = 1.28$ vs. $M_{\text{low-severity}} = 5.67$, $SE = 1.23$, $t(476) = 2.99$, $p < 0.01$), confirming the success of the manipulations.

Hypothesis testing. In Study 5, results (in Table 6) consistent with Study 4 confirm the robustness of the mediation pathways across severity conditions. Ind3 supports H2 and H3, while Ind2 reiterates forgiveness' significant role in severe incidents.

To test H8, a three-way ANCOVA was conducted with recovery strategy, error attribution, and error severity as independent variables, empathy as the dependent variable, and gender,

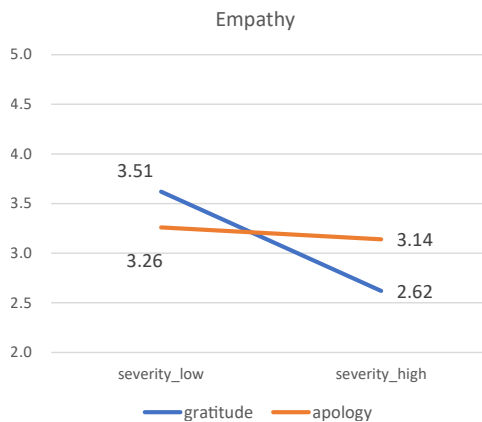


Figure 5. The interaction effect of recovery strategies and error severity on empathy (Study 4). Source: Authors' own work

age, education, and marital status as covariates. The analysis revealed a significant interaction between recovery strategy and error attribution ($F(1, 466) = 4.61, p < 0.05$). A significant interaction between recovery strategy and error severity was also observed ($F(1, 466) = 17.70, p < 0.01$). Notably, a significant three-way interaction among recovery strategy, error attribution, and error severity was identified ($F(1, 466) = 4.61, p < 0.05$), suggesting that the influence of recovery strategy on empathy depends on both error attribution and error severity. For high-severity errors, apologies are more effective in fostering patient empathy when the error is attributed to a system. However, for low-severity errors, gratitude is more effective than apology in fostering empathy, regardless of whether the error was attributed to a human or a system (Figure 6). Therefore, H8 is partially supported. To summarize the key findings, Table 7 presents each hypothesis alongside the corresponding study and the related results.

Discussion

Theoretical contributions

This study contributes to service recovery theory by applying and extending Lawler’s Affect Theory of Social Exchange (ATSE) (2001) to the emotionally charged context of healthcare.



Figure 6. The interaction effect of recovery strategy, error attribution, and error severity on empathy (Study 5). Source: Authors’ own work

Table 7. Summary of hypotheses and key findings

| Hypothesis | Study | Key finding | Supported |
|---|-------|--|-----------|
| H1: Gratitude vs. Apology effectiveness differs in evoking empathy, forgiveness, and trust | 1–5 | Gratitude generally more effective; results vary across contexts | Yes |
| H2: Empathy mediates the effect of recovery strategies on forgiveness | 1–5 | Mediation confirmed in all studies | Yes |
| H3: Forgiveness mediates the effect of empathy on trust restoration | 1–5 | Mediation confirmed in all studies | Yes |
| H4: Trait empathy moderates the effect of recovery strategies on state empathy | 1 | Stronger gratitude effect observed only among participants with high trait empathy | Partially |
| H5: Error history moderates the effectiveness of recovery strategies | 2 | Gratitude more effective only when no prior similar error | Yes |
| H6: Error attribution moderates recovery strategies effect on empathy | 3 | No significant interaction; both strategies yielded greater empathy in human-attributed errors | No |
| H7: Error severity moderates the recovery strategy effect on empathy | 4 | Gratitude effective in low-severity errors; apology effective in high-severity errors | Yes |
| H8: Error attribution × severity interaction moderates recovery strategy effect | 5 | Apology more effective in fostering empathy for high-severity, system-attributed errors; gratitude more effective for low-severity errors, regardless of attribution | Partially |

Source(s): Authors' own work

While ATSE emphasizes the role of affect in shaping relational outcomes, our findings advance the theory by demonstrating that symbolic recovery strategies, such as apologies and gratitude expressions, activate distinct emotional pathways depending on contextual conditions (e.g. error severity) and individual traits (e.g. trait empathy). This highlights that emotional responses to recovery communications are not uniform but contingent on the interplay between message framing, situational context, and recipient characteristics. By examining how these moderating influences shape ATSE's affective mechanisms within a healthcare setting, we refine ATSE's explanatory power and offer a more context-sensitive framework for understanding trust repair. We identify three interrelated themes that advance theoretical aspects of service recovery.

The power of saying thank you: redefining service recovery in healthcare. Our findings challenge the dominant assumption in healthcare service recovery strategies that apologies are the default symbolic strategy (Howley, 2009; Woods, 2007). Across five experiments, gratitude expressions emerged as a more effective tool than apologies in evoking patient empathy and fostering forgiveness. This aligns with recent studies in other industries showing gratitude's positive impact (Ahmadi and Fakhimi, 2021; Kato et al., 2021; You et al., 2020). However, it contrasts with traditional service recovery literature that has predominantly focused on the effectiveness of apologies (e.g. Bismark, 2009; Frantz and Bennisson, 2005; Kim et al., 2004). Additionally, our results differ from Fang et al. (2021), who noted the effectiveness of apologies in non-severe failures in restaurant contexts, highlighting the unique impact of gratitude expressions in healthcare. These findings qualify prior conclusions that gratitude is universally more effective than apology, revealing that their relative impact depends on the emotional stakes and contextual features of healthcare service failures. This discrepancy emphasizes the distinct nature of healthcare contexts, where patient vulnerability and the critical nature of services may amplify the impact of gratitude expressions, which reframe negative situations and foster positive reciprocity.

This research broadens ATSE (Lawler, 2001), demonstrating that gratitude expressions influence patient-provider interactions by boosting empathy and forgiveness after service failures. This indicates that the emotional tone of recovery strategies is key to shaping patient responses, reducing negative emotions from service failures, and leading to more favorable outcomes in empathy, forgiveness, and trust restoration.

Empathy and forgiveness: the emotional bridge to trust restoration. Our research identifies a critical emotional pathway in service recovery, where patient empathy and forgiveness serve as key mediators linking recovery strategies to trust restoration. Prior research mainly focused on the direct effects of these strategies on trust restoration (e.g. Basso and Pizzutti, 2016; Raza et al., 2023). However, our study sheds light on the underlying emotional mechanisms, emphasizing the roles of empathy and forgiveness. This sequential mediation indicates that effective recovery strategies in healthcare do not just directly rebuild trust; they trigger a cascade of emotional responses, starting with empathy, which fosters forgiveness, ultimately restoring trust. This finding extends prior work on the role of emotions in service recovery (e.g. Chebat and Slusarczyk, 2005; Schoefer and Diamantopoulos, 2008; Valentini et al., 2020) by specifically delineating the sequential nature of these emotional processes in healthcare contexts.

Theoretically, these findings bridge the gap between service recovery literature and the studies focusing on the emotional dynamics in healthcare (Berry and Bendapudi, 2007; McColl-Kennedy et al., 2017). They highlight the importance of emotional competence in healthcare providers, which is essential for effectively managing patient emotions during service recovery. This supports recent calls for more attention to the emotional dimensions of healthcare service (Berry et al., 2015). Moreover, our results enrich the literature on forgiveness in service recovery (e.g. Harrison-Walker, 2019; Joireman et al., 2016; Tsarenko et al., 2019), positioning it as a critical step from empathy to trust restoration in healthcare.

Context matters: tailoring recovery strategies in healthcare settings. Our findings reveal the complex interplay of individual characteristics, contextual factors, and recovery strategies in healthcare service recovery, offering several key insights that both support and challenge existing literature. Notably, gratitude expressions were more effective for patients with high trait empathy. This insight broadens the scope of existing research on individual factors in service recovery (Ahmadi and Fakhimi, 2021; You et al., 2020) to include the healthcare sector.

Furthermore, our study highlights key contextual factors shaping the effectiveness of recovery strategies. We discovered that gratitude expressions foster empathy more effectively than apologies when there are no prior similar errors. However, this benefit decreases with recurring errors, aligning with studies that show repeated service failures can diminish customer goodwill (Maxham and Netemeyer, 2002). These contextual results also help reconcile inconsistencies in prior comparative studies of apology and gratitude, showing that their relative effectiveness is not fixed but contingent upon factors such as error severity, attribution, and history.

Our findings demonstrate that error severity is a particularly influential moderator in the relationship between recovery strategies and patient responses, highlighting its importance in predicting the effectiveness of different recovery strategies in healthcare. For example, gratitude expressions significantly enhance recovery for low-severity errors. In contrast, apologies are more effective for high-severity errors, extending principles from general service recovery literature (Smith et al., 1999; Weun et al., 2004) to healthcare contexts. The emotional pathway of forgiveness also varies by error severity, with forgiveness playing a critical role in high-severity incidents where heightened emotional stakes and trust breaches make it essential for restoring trust.

Contrary to our hypothesis and earlier studies (Forrester and Maute, 2015; Vakeel et al., 2018; Walton and Hume, 2012), gratitude expressions consistently outperformed apologies across the attribution conditions tested. However, an important exception emerged: for high-severity errors attributed to system causes, apologies were more effective in fostering

patient empathy. This suggests that in serious, system-attributed failures, patients may expect direct accountability, which apologies more clearly communicate than gratitude expressions. These findings suggest that the impact of gratitude expressions may, in some contexts, outweigh typical attribution effects, particularly for low-severity errors. However, our results also show that in high-severity, system-attributed cases, apologies may still hold greater relational value. This subtle pattern calls for further research to better understand patient psychology in healthcare recovery scenarios.

Furthermore, our study highlights a novel aspect of how error severity and attribution interact. For high-severity errors, apologies are more effective in fostering patient empathy when they are system errors, as these errors prompt patients to seek substantial explanations. In contrast, for low-severity errors, gratitude expressions are more effective regardless of attribution. In cases of minor errors, gratitude expressions can elicit positive emotions that outweigh concerns about the cause of the error. This finding emphasizes the importance of healthcare providers carefully aligning recovery strategies with both error severity and perceived cause.

These insights enrich the literature on contextual factors in service recovery (e.g. [Maxham and Netemeyer, 2002](#); [Weun et al., 2004](#)) by deepening our understanding of the healthcare environment. They advocate for a context-sensitive approach to service recovery models in healthcare, exhibiting how situational variables and recovery strategies interact to shape patient responses in this unique environment.

Practical implications

Our research offers strategies for enhancing service recovery in healthcare contexts, acknowledging the complex reality faced by healthcare providers. Many practitioners, particularly doctors, are often reluctant to offer apologies due to legal concerns and fears of compromising their perceived competence ([Gara, 2007](#); [Howley, 2009](#)). Considering this, our findings suggest alternative approaches that can be equally or even more effective.

First, healthcare providers should prioritize integrating sincere gratitude expressions into their communication strategies, alongside a clear explanation, particularly for low-severity errors. For example, a statement like, ‘Thank you for your understanding.’ ‘We appreciate your patience as we work to resolve this issue,’ may help elicit patient empathy and reinforce trust.

Second, healthcare organizations should develop a tiered response system based on error severity. For low-severity errors, the emphasis should be on gratitude expressions, which carry minimal risk and can effectively elicit patient empathy and trust. For high-severity errors, where legal or reputational risks make providers more hesitant to apologize, our findings indicate that apologies remain more effective, particularly when the error is system-attributed. In practice, the communicator’s seniority should correspond to the severity of the incident. Frontline clinicians (e.g. attending physicians) may express gratitude directly to patients in low-severity cases, whereas for high-severity or system-attributed failures, senior representatives (e.g. department heads or hospital directors) should deliver apologies to convey institutional accountability. Furthermore, in cases of isolated incidents, gratitude expressions can be particularly effective. However, for recurring errors, healthcare providers should shift towards more comprehensive recovery strategies that address the root causes of repeated failures. To support implementation, healthcare managers should define what constitutes a low versus a high-severity error within their own settings. Common criteria include the level of harm, duration of impact, and reversibility, such as distinguishing between temporary discomfort and serious or irreversible harm. Applying this tiered framework can help align communication strategies with the severity of the incident.

In addition, training programs should enhance the staff member’s ability to elicit and foster patient empathy, given its crucial mediating role in restoring trust. For high-severity errors, strategies should aim to facilitate patient forgiveness through personalized communication

and more intensive follow-up care. Staff should also be trained to recognize cues of high-trait empathy in patients, such as cooperative tone, patience, or expressions of understanding, and tailor their communication accordingly within this framework. To ensure continuous improvement, healthcare organizations should implement feedback mechanisms to assess and refine these communication and training strategies.

By implementing these evidence-based approaches, healthcare organizations can create a more empathetic and effective service recovery environment. Strengthening patient trust and engagement through this tiered communication framework enhances the effectiveness of service recovery communications, providing healthcare organizations with a concrete basis for designing and training recovery practices.

Limitations and directions for future research

This study offers insights into service recovery strategies in healthcare but also has limitations. The use of hypothetical scenarios, while based on real-world incidents and validated through authenticity checks, may not fully reflect the emotional complexity of real-life healthcare service failures, potentially affecting the applicability of our findings. Moreover, emotional responses in real-world clinical contexts may be shaped by patients' cultural background, health literacy, prior healthcare experiences, and psychological resilience; these factors were not directly assessed in our study. Future research could incorporate these individual differences to better understand how diverse patient populations interpret and respond to symbolic recovery strategies.

While we varied the communicator's role by aligning it with the severity of the service failure, using the clinic's physician for the low-severity case and the hospital director for the high-severity case, this variation was not manipulated as an independent variable. Thus, we did not assess whether communicator status (e.g. frontline staff vs. senior managers) independently influences patient responses. Future studies could systematically investigate how the hierarchical position of the communicator shapes patients' responses. In addition, although initial communications were delivered by individual professionals, our measurement items referred to the institution (e.g. "the clinic" or "the hospital") to minimize the potential influence of hierarchical status on participants' responses. This design choice may have limited our ability to fully capture interpersonal dynamics in individual healthcare professionals. Future research could further distinguish the targets of emotional responses in healthcare service recovery by examining whether patients' empathy, forgiveness, and trust are primarily directed toward individual frontline employees or toward the organization, and how these relational targets might differ under conditions of human versus system error.

Furthermore, the study was conducted within a single cultural setting, which may limit the generalizability of our findings to healthcare systems in other countries with different expectations around communication, authority, and emotional expression. Future research should explore how cultural values (e.g. power distance or collectivism) interact with symbolic recovery strategies in healthcare contexts. Although we examined several important moderators, other factors, such as the pre-existing patient-provider relationship or the patient's health status, may also influence the effectiveness of recovery strategies.

Future research should include field studies in actual healthcare settings to validate our experimental findings and better capture patients' emotional responses to real service failures. Longitudinal studies could also explore how recovery strategies impact trust over time, assessing the long-term effectiveness of gratitude expressions. Moreover, investigating other psychological mediators, such as perceived sincerity or felt reciprocity, could deepen our understanding of why gratitude expressions work in service recovery.

In addition, while our findings highlight the promise of gratitude expressions in service recovery, ethical considerations must be acknowledged. Gratitude should not be viewed as a substitute for accepting responsibility, especially in the context of serious service failures. In such cases, using gratitude without an explicit acknowledgment of responsibility may be

perceived as evasive or insincere, potentially undermining patient trust. Future research should explore how perceptions of sincerity and accountability vary across error types and are shaped by communicator status, power asymmetries, and cultural norms for apology and gratitude.

Finally, we acknowledge that legal constraints may affect healthcare providers' willingness to offer apologies in certain healthcare systems, where the risk of lawsuits can limit their use. Future studies could investigate how legal frameworks influence communication strategies and patient responses to service recovery across diverse regulatory environments.

As healthcare evolves with digital technologies, future studies should examine how empathy translates in interactions mediated by AI, such as through AI-powered chatbots. Understanding the role of empathy in these digital interactions will be crucial for designing empathetic AI systems in healthcare.

Conclusion

This study advances understanding of service recovery in healthcare by examining how gratitude expressions, compared to apologies, shape patient empathy, forgiveness, and trust. It extends the Affect Theory of Social Exchange by demonstrating that symbolic recovery strategies operate through affective rather than purely cognitive mechanisms, offering a theory-based explanation of how emotional responses restore relational trust in healthcare settings.

The findings provide a practical, evidence-based foundation for tailoring post-failure communication strategies to contextual and individual factors. These insights contribute to the broader service recovery literature while offering actionable guidance for healthcare providers seeking to adopt more empathetic and context-sensitive approaches to trust repair.

As healthcare systems increasingly emphasize patient-centered care, strengthening relational resilience after service failures will be essential. This research supports the use of emotionally attuned recovery strategies to enhance patient experiences, rebuild trust, and help sustain stronger patient-provider relationships.

Appendix 1

Overview of experimental design

Table A1. Overview of Experimental Scenarios

| Study | Scenario context | Communication | Contextual factors | Design structure |
|-------|--|-----------------------|--|------------------|
| 1 | Wrong vaccine (low severity) | Apology vs. Gratitude | Trait empathy (high vs. low) | 2 × 2 |
| 2 | Wrong vaccine (low severity) | Apology vs. Gratitude | Error history (no vs. repeated) | 2 × 2 |
| 3 | Wrong vaccine (low severity) | Apology vs. Gratitude | Error attribution (human vs. system) | 2 × 2 |
| 4 | Wrong vaccine (low severity) and wrong surgery (high severity) | Apology vs. Gratitude | Error severity (low vs. high) | 2 × 2 |
| 5 | Wrong vaccine (low severity) and wrong surgery (high severity) | Apology vs. Gratitude | Error severity (low vs. high) × Attribution (human vs. system) | 2 × 2 × 2 |

Source(s): Authors' own work

Wrong vaccine scenario: low-severity (Studies 1–5):

A family consisting of a couple in their 30s and their two young children, ages 7 and 5, visited the Guangzheng clinic for what was supposed to be a routine flu vaccination. However, the clinic staff mistakenly administered COVID-19 vaccines to the family instead. The children received dosages intended for older age groups. Shortly afterward, all family members began experiencing mild allergic reactions like rashes and were very worried about the potential health effects. Additionally, one child has been under close observation due to a fever. Realizing the error, the physician of the clinic immediately called the family.

Respond with an apology (Studies 1–5):

We are deeply sorry for the serious error that occurred during your visit. We recognize the gravity of this situation and are committed to making things right. We apologize again and hope you will give us another chance to take care of you properly.

Respond with an expression of gratitude (Studies 1–5):

Thank you for your understanding and patience as we address this significant mistake. We deeply appreciate your continued support and are committed to making things right. Thank you again for giving us another chance to take care of you properly.

Error history conditions (Study 2):

- (1) It is known that this clinic has never experienced such an incident before. This is the first time since its establishment that a vaccination error has occurred.
- (2) It is known that the clinic previously encountered a similar incident of administering the wrong vaccine half a year ago. This is the second such error within a six-month period.

Human error condition (Study 3 and 5): the oversight of the on-duty nurse.

System error condition (Study 3 and 5): a glitch in the clinic's computerized vaccine registration system.

Wrong surgery scenario: high-severity (Studies 4–5):

A patient at Hongwen Hospital was hospitalized due to low blood pressure but was mistakenly sent to the operating room for thoracic surgery. After the surgery was completed, the ward nursing staff realized the mistake and immediately transferred the patient to the intensive care unit for observation. Upon learning that the patient underwent the wrong surgery, the hospital director immediately called the family.

Human error condition (Study 5): the oversight of the on-duty physician.

System error condition (Study 5): a technical failure in the hospital's patient information management system.

Notes

1. <https://news.tvbs.com.tw/amp/world/2349721>
2. <https://health.tvbs.com.tw/medical/346227>
3. <https://www.drsurveydone.com>
4. The social media platform widely used in Taiwan, Japan, and South Korea.

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