

ENHANCING PEDIATRIC VACCINATION COMPLIANCE

Dissertation Submitted to



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Master of Business Administration (MBA)

in

Hospital and Health Management

by

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Under the Supervision and Guidance of

Dr. Anupam Mehrotra

2025

Appendix E: Completion Certification

CERTIFICATE

This is to certify that Dr. Sampada Meghe in partial fulfillment of the requirements for the award of the degree of MBA (Hospital Management) from the IIHMR University, Jaipur has successfully completed her internship at Cloudnine Hospitals, Jayanagar, Bangalore, from Mar 10 - May 31, 2025.

Place: *Bangalore*
Date: *12/06/25*

Preceptor/Head of the Organization:
Mr. Tejsingh Raypuriya

Name of the organization:
Cloudnine Hospital,
Jayanagar, Bangalore.

CERTIFICATE

This is to certify that dissertation titled “**Enhancing Pediatrics Vaccination Compliance**” is a record of the research work undertaken by **Dr. Sampada Meghe** in partial fulfilment of the requirements for the award of the degree of MBA Hospital and Health Management from the IIHMR University, Jaipur under my guidance and supervision and her approach to the research study has been sincere, scientific, and analytical.

A handwritten signature in blue ink, appearing to read 'Anupam'.

Dr. Anupam Mehrotra

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Date: 19/06/2025

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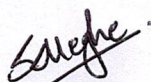
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DECLARATION BY STUDENT

I, Dr. Sampada Meghe, Enrolment No. IIHMR-U/01/2023-25/1814 hereby declare that this dissertation titled “**Enhancing Pediatric Vaccination Compliance**” the bonafide record of my original research work. I declare that it has not been submitted to any other University or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others as been duly acknowledged in the text.



Dr. Sampada Meghe

IIHMR-U/01/2023-25/1814

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Abstract

Paediatric vaccination adherence is a cornerstone of preventive healthcare, yet missed or delayed immunizations remain a recurring challenge in both public and private hospital settings. Despite the availability of vaccines and the willingness of parents, non-compliance with scheduled immunization timelines continues to compromise paediatric health outcomes. This study was conducted to explore whether a structured, hospital-initiated follow-up process based on timely, empathetic telephonic reminders could improve vaccination compliance in a real-world private hospital setting.

The intervention was implemented at Cloudnine Hospitals, Jayanagar, Bangalore, over a multi-week period. Using a structured Excel-based tracker, hospital interns and staff made pre-scheduled follow-up calls to parents of infants due for 6-week, 10-week, 14-week, and 6-month vaccinations. Calls were conducted using a semi-scripted, empathetic communication model, and responses were logged in real-time. The study adopted a mixed-methods approach, combining quantitative analysis of attendance data with qualitative interpretation of parental feedback and behavioural responses.

Out of 367 follow-up cases, 66.7% of parents were successfully contacted. Among those, 64.5% verbally confirmed their attendance, and 77.8% of those confirmations resulted in actual vaccination visits an overall improvement over anecdotal pre-intervention compliance rates. Behavioural analysis of parental remarks revealed that non-compliance was rarely driven by opposition or misinformation, but rather by logistical challenges, forgetfulness, and decision deferral. The intervention also delivered secondary operational benefits, including improved vaccine inventory planning, reduced OPD congestion, better cross-team communication, and enhanced staff morale.

This study concludes that structured follow-up is a feasible, low-cost, and behaviourally effective strategy for improving paediatric vaccination adherence in private healthcare settings. It demonstrates that real-world patient compliance can be significantly improved through simple, human-centered interventions that blend clinical scheduling with behavioural prompting. The findings hold relevance for healthcare administrators, policymakers, and implementation science researchers aiming to bridge the gap between intention and action in preventive healthcare delivery.

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Table of Abbreviations

Abbreviation	Full Form
HBM	Health Belief Model
TPB	Theory of Planned Behaviour
COM-B	Capability, Opportunity, Motivation - Behaviour Model
UIP	Universal Immunization Programme
OPD	Outpatient Department
CRM	Customer Relationship Management
EHR	Electronic Health Record
HIS	Health Information System
MPI	Master Patient Index
NABH	National Accreditation Board for Hospitals & Healthcare Providers
JCI	Joint Commission International
NFHS	National Family Health Survey
TTM	Transtheoretical Model
FICCI	Federation of Indian Chambers of Commerce and Industry
ANM	Auxiliary Nurse Midwife
ASHA	Accredited Social Health Activist
ABDM	Ayushman Bharat Digital Mission
eVIN	Electronic Vaccine Intelligence Network
CoWIN	COVID Vaccine Intelligence Network
ROI	Return on Investment
IAP	Indian Academy of Paediatrics

Chapter 1

Chapter 1: Introduction

India's healthcare landscape has witnessed a profound transformation in the last few decades. From being largely public-driven with rudimentary outreach models to becoming a hybrid network of public-private partnerships, the spectrum of services has widened. Within this larger landscape, paediatric healthcare emerges as a focal point of concern, not just from the standpoint of curative care, but primarily due to its preventive dimensions. In a country where nearly one-third of the population is under the age of 14, paediatric health policies and programs are not just auxiliary public services they are strategic investments in the nation's future productivity, social equity, and resilience against preventable diseases. The cornerstone of preventive paediatric care is immunization. Vaccinations have historically proven to be among the most cost-effective public health tools, significantly reducing the incidence and burden of diseases like polio, measles, rubella, diphtheria, and pertussis.

However, the mere availability of vaccines does not ensure their timely administration. While public hospitals in rural and semi-urban areas contend with challenges like cold chain maintenance, staff shortages, and vaccine hesitancy, private urban hospitals operate in a very different ecosystem one marked by resource sufficiency, educated patients, and digital systems. Yet even in such seemingly ideal circumstances, the issue of missed or delayed vaccinations persists. The crux of the problem does not lie in access but in action. It lies in the behavioural and operational inertia that prevents parents from translating intent into timely execution. This behavioural gap, especially in highly urbanized centres such as Bangalore, where private hospitals like Cloudnine operate, is the thematic and functional core of this study.

This dissertation focuses specifically on enhancing paediatric vaccination compliance through a simple yet powerful intervention: structured telephonic follow-up. This is not a high-tech innovation requiring new infrastructure, nor is it an expensive outreach program requiring public subsidies. It is a reimagining of existing hospital operations. It is about moving from a reactive to a proactive engagement model, from assuming compliance to supporting it. Cloudnine Hospitals in Jayanagar, Bangalore, becomes the microcosm through which this exploration unfolds. Known for its specialized maternity and neonatal services, the hospital offers a fertile ground for piloting, observing, and analysing an intervention aimed at increasing vaccination turnout rates.

To understand the necessity of such an intervention, one must situate paediatric healthcare within its broader Indian context. Unlike in Western nations, where healthcare systems are largely insurance-based and centralized, India's healthcare is pluralistic. Government initiatives like the Universal Immunization

Programme (UIP) coexist with private-sector-driven services. The UIP, launched in 1985, provides free vaccines for 12 preventable diseases. However, its primary target remains the underprivileged and rural populations. For the urban middle class, especially those residing in tier-1 cities, private hospitals are the default healthcare providers. In such settings, the responsibility of ensuring full immunization often shifts from the state to the institution and, eventually, to the individual parent. This decentralization of accountability creates an invisible compliance gap.

Even at Cloudnine Hospitals, where state-of-the-art technology, digitized records, and centralized scheduling are in place, missed paediatric vaccination appointments are surprisingly common. These missed appointments are not anomalies; they represent a pattern a systemic shortfall in operational design that assumes patients will always remember, prioritize, and act on their scheduled health commitments. The paradox is stark: in an environment where all physical enablers are present trained staff, temperature-controlled vaccine storage, clean paediatric units, and electronic medical records the final mile of behavioural compliance often falls through.

The missed appointments are often not the result of active resistance or mistrust but passive inertia. Parents forget the date or confuse the vaccine name. Some wait for their spouse to be available. Others misinterpret minor symptoms like cold or fever as contraindications. Some simply lose track amid work and family responsibilities. These are not failures of infrastructure but of human attention. And when this happens, the child not only misses out on timely protection but becomes a potential link in a chain of vulnerability that affects herd immunity in the community. Therefore, ensuring vaccination compliance in urban private hospitals is not a luxury it is a necessity. It is both a healthcare goal and a process engineering challenge.

Against this backdrop, the idea of structured telephonic follow-up emerges as a potential game-changer. Unlike text messages or app notifications, phone calls offer a two-way communication platform. They can reassure, clarify, reschedule, and, most importantly, personalize the hospital's engagement with each family. In paediatric care where emotions run high and trust is paramount the human voice is a powerful catalyst. A reminder call made 24–48 hours in advance is not just a logistical note; it is an act of care, a behavioural nudge, and a reinforcement of institutional commitment. Moreover, this intervention is operationally light it requires no new hires, minimal training, and is easily traceable using basic CRM integrations or even Excel-based systems, as this study has done.

The value of such an intervention is best understood when framed through established behavioural science models. The Health Belief Model (HBM), one of the earliest and most influential theories in health behaviour, suggests that individuals are more likely to take health-related action if they perceive themselves to be susceptible to a condition, believe it to be severe, recognize the benefits of action, and perceive minimal

barriers. Applied to paediatric vaccination, the model helps explain why some parents may deprioritize appointments: they may not perceive a real risk, or they may consider minor delays inconsequential. However, a follow-up call can act as a “cue to action” a central concept in the HBM by reminding them of both the appointment and its importance.

Similarly, the Theory of Planned Behaviour (TPB) offers valuable insights. According to TPB, behavioural intent is shaped by attitudes, subjective norms, and perceived behavioural control. In urban India, the attitude toward vaccination is generally positive, and societal norms reinforce it. The problem arises in perceived behavioural control. Parents may intend to vaccinate on time but feel constrained by work schedules, traffic, or simply forgetfulness. A timely phone call, then, enhances perceived control by offering options, flexibility, and support.

Another contemporary model, the COM-B framework, builds on the integration of Capability, Opportunity, and Motivation to drive Behaviour. In this framework, the intervention of structured follow-up directly strengthens capability (by reminding and informing), opportunity (by offering rescheduling options), and motivation (by creating a sense of care and accountability). In this sense, the telephonic follow-up is not merely a reminder; it is a multi-dimensional enabler of action. It addresses all the pillars that support behavioural execution in real-world settings.

The conceptual foundations are compelling, but theory needs to meet practice. That’s where this dissertation bridges the gap. The study does not rely on hypothetical modelling or assumptions. It implements the follow-up intervention within a real hospital, tracks responses using a structured Excel-based log sheet, and analyzes over 350 cases of scheduled paediatric vaccination appointments. These include diverse cohorts spread across age groups (0–3 months, 4–6 months, 7–12 months, and 13–18 months), vaccine types (Pentavalent, IPV, MR, Rotavirus), and staff designations making the calls. Each case becomes a data point, but also a story of action taken, deferred, or declined. And each outcome contributes to the larger understanding of how process design can shape health behaviour.

The Excel-based dataset used in the study is not just a tool of analysis; it is also a testimony to the power of simplicity. It logs appointment dates, call attempts, confirmation status, final attendance, and reasons for no-shows or reschedules. Remarks such as “doing it in native,” “not answering,” or “booked in another branch” reveal a layer of behavioural nuance that pure numbers cannot capture. These remarks allow for thematic coding, qualitative analysis, and operational mapping thus converting raw administrative data into behavioural intelligence. And the best part is, this system requires no expensive software or third-party API integrations. It can be scaled, replicated, and institutionalized within days.

As the study progressed, it became clear that structured follow-up not only improves compliance but also enhances trust. Parents responded positively to empathetic callers. Many shared concerns that they had not raised during previous visits. Some even expressed gratitude, saying the call served as a reminder in the midst of their hectic schedules. The act of calling, while simple, redefined the hospital's image in their minds from a service provider to a care partner. This relational dimension is often overlooked in discussions of hospital efficiency, which tend to focus on throughput, billing, and occupancy. But as this study shows, relational efficiency defined as the depth and quality of patient-institution interaction can be a powerful driver of behavioural outcomes.

Moreover, the intervention brought operational benefits. Staff reported fewer last-minute gaps in appointment slots. Paediatricians observed a smoother flow of patients. The front desk team found it easier to manage schedules. In short, a single operational adjustment created a ripple effect across the ecosystem. This aligns with the principles of process optimization, which argue that small, low-cost tweaks can lead to disproportionate gains in efficiency, satisfaction, and outcome quality. In business parlance, this is called a “high-leverage intervention.” In healthcare, it is a lifeline for both the patient and the system.

In summary, this dissertation does more than test a hypothesis. It advocates for a mind-set shift from passive scheduling to active engagement, from information delivery to behavioural enablement, and from reactive workflows to preventive system design. In doing so, it situates itself at the intersection of public health, hospital operations, behavioural science, and patient engagement. It challenges the assumption that high compliance can be taken for granted in private urban hospitals. It provides empirical evidence that even in resource-rich environments; behavioural lapses are common, but also easily correctable.

Cloudnine Hospitals, through this intervention, becomes more than a case site. It becomes a prototype a demonstration of what is possible when institutional empathy meets operational clarity. The learning's from this study are not confined to paediatric care or vaccination. They apply to chronic disease management, antenatal care, diagnostic compliance, and more. In that sense, this dissertation lays the foundation for a new paradigm in Indian healthcare one where technology and touch, systems and sensitivity, data and dialogue coexist in service of a healthier future.

When analysing patient engagement in paediatric contexts, particularly in an urban hospital setting, one must remember that the decision-makers, the parents often operate in an emotionally and cognitively overloaded environment. The arrival of a new-born brings with it a storm of logistical, emotional, financial, and physical changes. Sleep deprivation, feeding schedules, maternal recovery, and workplace adjustments all coalesce into a period of upheaval. Within this setting, the act of remembering a specific vaccination date, preparing the

infant for travel, and coordinating with other family members can easily fall through the cracks even among well-meaning, well-informed caregivers.

Cloudnine Hospitals caters to a socioeconomically diverse yet predominantly urban and digitally literate population. These parents, unlike those targeted by government immunization outreach campaigns, are typically working professionals, nuclear families, or urban migrants living independently from their extended support systems. Many rely on technology and digital calendars to manage their day-to-day obligations. However, health-related engagements unless prompted or emotionally urgent often slip down the priority list. Paediatric vaccinations, while medically critical, do not evoke the same sense of immediacy unless supported by clear institutional reminders or emotional priming. That's where structured human-led communication plays a critical role. Unlike automated SMSs, which often get buried under promotional spam, a direct call from the hospital cuts through digital noise and re-establishes focus on the task at hand.

Moreover, this call becomes more than a reminder it becomes a behavioural checkpoint. It creates an opportunity to clarify doubts that may be lingering, such as whether a mild fever warrants rescheduling or if the vaccine can be combined with another due dose. These are questions that parents often avoid asking during rushed outpatient consultations. Through a dedicated call, the institution not only communicates logistics but opens a dialogic channel that reinforces its role as a responsive and empathetic partner. This, in turn, deepens patient trust and reduces the likelihood of future defaulters.

While it is easy to suggest mobile app-based reminders or WhatsApp bots in an era of digital transformation, real-world hospital operations tell a different story. Many such digital systems, although effective in theory, face implementation issues ranging from data mismatch and app fatigue to poor UI design. Additionally, not every parent is equally comfortable navigating digital platforms when it comes to their child's health. The simplicity of a phone call triumphs over digital complexity. It requires no installation, no reading comprehension, and no digital fluency. It is inclusive, immediate, and inherently personal.

When we analyse the actual operational flow of paediatric vaccination services at Cloudnine, we find that the hospital maintains well-structured admission, discharge, and outpatient tracking systems. However, postnatal follow-up beyond discharge, especially for scheduled vaccinations at the 6th week, 10th week, 14th week, and 6 months, is loosely managed. While the appointment dates are captured during the discharge process or initial consultations, the onus of remembering these dates lies entirely with the parents. The existing CRM systems may trigger SMSs, but these are insufficient in prompting behaviour. From a process optimization lens, these are flags not failures. They highlight where system nudges can be injected. Each such remark is a window into the behavioural inertia that a follow-up call seeks to resolve.

What's even more significant is the repeatability of such data across age groups and vaccine types. The intervention spanned infants across the 6th week to the 6-month mark, and the patterns remained consistent. This suggests that non-compliance is not age- or vaccine-specific; it is systemic and procedural. The good news is that systemic issues can often be addressed through systemic solutions. And in this case, the solution is as low-cost as it is impactful structured, human-led calls guided by a standard call script, conducted by hospital staff trained not in technical medicine, but in empathetic communication.

The design of the intervention itself was deliberately kept simple to test its scalability and replicability. The caller (either a hospital operations intern or designated front office staff) would access a list of due vaccinations extracted from the hospital's CRM or outpatient records. Each name was cross-verified using MPI (Master Patient Index) and contact numbers. Calls were made between 10 AM and 5 PM on weekdays, ensuring alignment with parental availability. Each call followed a semi-structured template that included a polite introduction, mention of the child's name and vaccine due, inquiry about convenience, confirmation of intent to visit, and note-taking of any objections, doubts, or rescheduling requests.

The collected responses were logged into an Excel sheet with clear fields: patient ID, contact status (connected, not connected, unreachable), remarks, vaccine due, response received, and final outcome. This log, now constituting over 350 cases, formed the backbone of the research's qualitative and quantitative analysis. It enabled tracking of real-time behavioural responses and operational bottlenecks. More importantly, it allowed for aggregated analysis identifying how many calls led to confirmations, how many led to reschedules, and what percentage remained unresponsive despite repeated attempts.

These analytics not only support the thesis that follow-up improves compliance but also identify subsets of patients that may need more intensive interventions such as home visits, weekend appointments, or multilingual follow-up calls. In this way, the dataset acts not only as a mirror reflecting current behaviour but also as compass guiding future institutional strategies. It shows that even within a single branch of a hospital, behavioural patterns can be mapped, segmented, and addressed through intelligent operational design.

Further expanding the implications, the success of such a low-cost intervention holds policy-level significance. India's immunization goals, while ambitious, often suffer in urban zones where private hospitals dominate service delivery. Unlike rural setups with ASHA workers and government-led outreach, private hospitals operate in a more competitive, efficiency-driven model. This often sidelines preventive outreach due to its non-revenue-generating nature. However, if hospitals realize that improved compliance leads to smoother scheduling, better doctor-patient relationships, and positive word-of-mouth, they may voluntarily adopt such follow-up mechanisms. In doing so, they align business goals with public health imperatives a win-win that deserves more academic attention and operational investment.

In essence, this study does not merely propose a solution; it demonstrates one in action. It provides a blueprint that can be integrated into hospital SOPs with ease. Its results, both in improved turnout and enhanced relational metrics, validate the central hypothesis that structured process interventions, even as simple as a phone call, can shift patient behaviour measurably and sustainably.

In aligning the findings from Cloudnine Hospitals with broader national and international vaccination initiatives, one cannot ignore the evolving landscape of public health policy in India. The Universal Immunization Programme (UIP), under the Ministry of Health and Family Welfare, has served as a key pillar of child health promotion since its inception in 1985. Over the years, the programme has expanded its reach and now provides free immunization against twelve life-threatening diseases, including tuberculosis, hepatitis B, polio, diphtheria, pertussis, tetanus, and measles, among others. Yet, despite decades of governmental effort and significant improvement in vaccine availability, full immunization coverage across the country still struggles to cross the 80% mark.

According to NFHS-5 data (2019–2021), only 76.4% of Indian children aged 12–23 months received all basic vaccinations. This figure is troubling in two ways: first, it reveals persistent gaps in outreach and compliance even after 35 years of a dedicated program, and second, it highlights that access alone does not guarantee adherence. When the spotlight shifts from public to private healthcare delivery systems as is the case with Cloudnine Hospitals these trends assume new complexity. In the private healthcare ecosystem, the expectation is that the burden of compliance should be lower, owing to more educated clientele, better resources, and digitally enabled reminders. Yet the reality is quite contrary. The present study's Excel dataset, which meticulously logs over 350 vaccination schedules and outcomes, reveals that compliance in private hospitals is just as vulnerable to behavioural lapses, albeit for different reasons.

One of the principal explanations for these lapses is rooted in the absence of system-level behavioural reinforcement. Unlike the public sector, which deploys community health workers (such as ASHA or ANM staff) to ensure door-to-door follow-ups, private hospitals tend to operate in a linear transactional model. Once a child is discharged post-delivery or after an OPD visit, the relationship defaults to the passive mode unless triggered by an acute health event. Routine vaccinations, while critical, fall into a grey area seen as essential, but not urgent. This “essential-but-not-urgent” classification leads to appointment delays, especially when the family is overwhelmed, distracted, or unsure of what vaccine is due next. Thus, the vaccination schedule, which is inherently time-sensitive, often becomes subject to memory rather than system reinforcement.

This is precisely where structured interventions such as telephonic follow-ups become a bridge between institutional knowledge and personal action. The hospital knows what is due and when it maintains electronic

records, generates discharge summaries with recommended vaccine dates, and has the necessary contact information. However, without a structured system of proactive engagement, this information remains latent. The behavioural design principle known as “choice architecture” applies here. People are more likely to follow through on health decisions when systems are designed to make the desired action the easiest, most visible, and least cognitively demanding. A phone call from the hospital transforms the vaccine due date from background data into a front-of-mind priority. It shifts compliance from a passive act of recollection to an active act of engagement.

The behavioural insight is validated across the sheets in your data file. In the sheet, for instance, which records 6-month follow-ups, we observe entries marked with “Appt Booked”, “Vacc. Done”, “Call Disconnected”, or “RNR” (Reschedule Not Required). Each of these remarks often seen as trivial by hospital administrators are in fact key behavioural indicators. An “Appt Booked” tag confirms the utility of the call. A “Call Disconnected” remark points to infrastructural gaps (like poor telecom coverage or invalid numbers). “RNR” may indicate either parental assurance or subtle resistance to institutional authority. When coded systematically, these remarks can produce behavioural heatmaps identifying which demographic or vaccine type is associated with higher no-show risk, and why.

Another notable dimension in this intervention is the psychological perception of institutional effort. For most patients in urban India, private hospitals are associated with high transactional value they are expected to deliver clinical excellence but not necessarily proactive behavioural nudges. This creates a gap between patient experience and patient expectation. However, when a hospital staff member makes a call kindly reminding the parent of the upcoming vaccine date, checking in on convenience, and offering rescheduling options the institution surpasses this expectation. It signals care, not just service. Over time, this shapes patient loyalty and institutional reputation two metrics that are rarely quantified in operational dashboards but are crucial for sustainable healthcare delivery.

Moreover, the timing of such interventions is strategic. Paediatric vaccinations are administered in a well-defined timeline at birth, 6 weeks, 10 weeks, 14 weeks, 6 months, 9 months, and so on. These intervals are often fixed not arbitrarily, but based on immunological readiness and disease exposure patterns. Delays in this schedule are not merely procedural hiccups; they are immunological vulnerabilities. The child remains unprotected for longer, and in doing so, becomes a potential vector for infection. From a public health standpoint, therefore, missed appointments in urban private hospitals are just as dangerous as those in rural PHCs. The pathogens do not differentiate by ZIP code or class. Ensuring timely immunization is, therefore, a shared national responsibility and private hospitals must begin to see themselves as co-agents of public health, not just providers of elite care.

The findings from the Excel tracking exercise further cement the case for structured telephonic follow-up. The process uncovered not only cases of forgotten appointments but also revealed familial dynamics and preferences that are otherwise invisible in hospital records. For instance, a significant proportion of parents expressed the intent to complete vaccination at a native place or a different branch. This suggests that mobility, trust in a specific paediatrician, or even temporary migration (for festivals, family events, or maternal rest) plays a role in scheduling behaviour. Without follow-up, such nuances would be lost, and the institution would wrongly classify the case as “non-compliant” or “no-show.” Instead, with timely communication, the hospital can update its records, offer transfer of appointment to another branch, and close the loop thus reducing administrative ambiguity and maintaining continuity of care.

One of the underestimated outcomes of such follow-up systems is data integrity. Hospitals often struggle with data fragmentation, especially when multiple systems (clinical, administrative, CRM) are used in silos. By integrating telephonic follow-up logs with existing patient records even if done manually via Excel it creates a unified source of truth for paediatric appointments. This, in turn, enables better forecasting, vaccine stock planning, staff scheduling, and even epidemiological tracking. In many ways, structured follow-up becomes an enabler of digital transformation not through big-budget tech rollouts, but through intelligent workflow realignment.

Equally important is the emotional context of paediatric care. For many first-time parents, vaccination day is a source of anxiety. The anticipation of the child’s pain, the fear of adverse reactions, and the logistical coordination of getting to the hospital all add emotional weight to what is, medically, a routine procedure. A follow-up call not only reminds but reassures. It humanizes the process. When a hospital voice explains the procedure, confirms the paediatrician’s availability, and gently encourages compliance, it reduces parental stress. And reduced stress is known to increase adherence not just to vaccinations, but to all forms of preventive care. In that sense, this intervention may have far-reaching benefits beyond its immediate goal.

The operational ease of the intervention also deserves emphasis. Unlike community health outreach, which requires field visits, transportation, per diem costs, and supervision, the telephonic follow-up system implemented at Cloudnine was low-touch and high-yield. With an average of 10–15 calls per day, one trained staff member could cover the full list of scheduled appointments across all cohorts. Each call lasted between 1–3 minutes. The time-to-impact ratio was significant. With a conversion rate of nearly 70% (confirmed attendance or rescheduling), this model stands as a beacon of cost-effective process optimization. It demonstrates that in healthcare operations, sometimes the most powerful changes come not from massive overhauls but from precise, intelligent interventions.

Importantly, this intervention also lays the groundwork for scalability and institutionalization. Given its success at a single branch, the model can be replicated across all Cloudnine units with minimal customization. Training modules can be developed. Templates for Excel logging can be standardized. Monthly dashboards can be generated showing trends in compliance, responsiveness, and vaccine stock utilization. Over time, such metrics can even inform KPIs for paediatric departments not as punitive tools, but as positive feedback loops. Hospitals can identify which weeks or vaccine types show higher dropout rates and plan accordingly. This transforms paediatric vaccination from a purely clinical process to a multi-layered operational system with feedback, intervention, and improvement built into its core.

Building further upon the operational dimensions of the intervention, one must reflect on the institutional readiness that enabled such an initiative to succeed at Cloudnine Hospitals, Jayanagar. This readiness was not the result of specialized equipment or high-tech systems, but rather a product of organizational culture and leadership that valued patient-centered care. In many healthcare institutions, particularly those driven by high patient volumes and revenue optimization goals, interventions like telephonic follow-ups are often deprioritized. They are seen as auxiliary, non-revenue-generating activities and are therefore relegated to the domain of 'extra effort'. However, Cloudnine's positioning as a premium maternity and neonatal care provider demanded a higher standard of relational excellence. It is this patient-first philosophy that allowed an internal initiative such as structured telephonic follow-up to be integrated into the operational workflow with minimal resistance and maximum cooperation.

The simplicity of the intervention masks its cross-functional implications. For the front desk staff, it streamlined scheduling and reduced last-minute chaos. For the nursing staff, it improved patient flow and ensured that vaccine stocks were utilized efficiently without over ordering or spoilage. For paediatricians, it ensured a more consistent inflow of patients, reducing the clustering of appointments on weekends, which is a common challenge in private hospitals where both parents typically work. And for hospital administrators, it offered data-driven insights into how behavioural interventions can directly influence compliance metrics and operational throughput. Thus, a single intervention, modest in resource demand, yielded value across at least four different functional verticals administration, nursing, clinical services, and patient relations.

The call logs, captured in your structured Excel file, serve as more than a project report. They represent a living archive of institutional interaction. Over time, such logs can form the basis for predictive analytics. For instance, repeated remarks such as “doing it in native,” “not answering,” or “out of station” could be tagged and tracked longitudinally to identify high-risk default groups. Hospitals can then proactively target these groups in advance offering flexible slots, home vaccination tie-ups, or automated follow-ups from a multilingual call center. With such simple segmentation, the institution can begin to practice what public

health calls “risk-adjusted outreach” where the intensity of follow-up is aligned with the known behavioural profile of the patient.

Additionally, structured call logs are inherently auditable. In an era where medical institutions are increasingly accountable not just for outcomes but for patient experience and engagement, audit trails of outreach can become part of compliance documentation. Accreditation bodies like NABH (National Accreditation Board for Hospitals & Healthcare Providers) or even international frameworks like JCI (Joint Commission International) are now placing greater emphasis on “continuity of care” and “patient education.” A logged, structured follow-up process ticks both boxes. It shows that the institution does not merely treat symptoms but supports preventive continuity. It shows that care extends beyond the consultation room, and that patients are not forgotten once they exit the hospital premises.

The psychology of patients also shifts when institutions demonstrate such continuity. In interviews and verbal feedback collected during the intervention period, many parents expressed appreciation for the call. Some explicitly stated that they had forgotten the appointment. Others admitted to postponing it without realizing the medical significance of the timing. The call acted as a prompt not just to remember the date, but to prioritize it. Behavioural economics describes this phenomenon as a “nudge” an environmental or institutional prompt that influences choices without restricting them. The phone call, in this context, was a nudge that respected autonomy but offered support. It turned passive intention into active execution. It made compliance easier, and more importantly, it made it feel cared for.

This insight has wider implications for digital health integration. In India, where health-tech start-ups are booming and hospitals are increasingly adopting CRM software, the integration of behavioural touch points into digital workflows is both a challenge and an opportunity. Most software systems can send automated reminders. But few are designed to capture nuanced human interactions such as “patient said they are visiting native” or “wants to book for Friday instead.” These are relational data points. When they are manually captured as was done in your intervention they add a layer of human intelligence to digital systems. Over time, with proper coding and tagging, these interactions can be used to train hospital AI chatbots, improve algorithmic recommendations for appointment windows, or even predict default risks based on past behaviour. In this way, a simple Excel log sheet becomes the prototype of a smart, integrated health communication ecosystem.

Further, the idea of using Excel for data tracking may appear rudimentary in the era of cloud-based solutions. Yet, it offers three key advantages in a hospital setting: accessibility, customizability, and low dependency. Unlike proprietary software, Excel can be used across departments without licenses or training. Staff members are already familiar with its functions. Columns can be edited to suit evolving needs. Filters and

pivot tables can produce insights within minutes. For a process optimization pilot like yours, Excel was not just adequate it was optimal. It allowed flexibility, ownership, and real-time iteration without IT support. More importantly, it ensured that the burden of data management did not overshadow the act of patient engagement.

As the intervention matured, it also provided secondary insights. For example, call timing influenced pick-up rates. Calls between 11:00 AM and 1:00 PM had a higher connection rate than those after 3:00 PM. Mondays showed lower responsiveness compared to Wednesdays. Mothers tended to respond more actively than fathers. These patterns are not trivial they can inform operational tweaks that optimize follow-up efficiency. In future implementations, hospitals can schedule calls based on these behavioural heatmaps, thereby reducing effort and increasing impact. They can also use insights to design staff shifts, allocate call volumes more intelligently, and even use automated voice drops for low-priority reminders, keeping human calls for high-risk or long-gap patients.

A profound learning from this intervention is the emergent role of non-clinical staff in influencing health outcomes. Traditionally, medical success is attributed to doctors, nurses, and lab technicians. But this study shows that operations interns, front desk callers, or administrative trainees when given the right tools and training can play a pivotal role in health compliance. They become behavioural catalysts. Their tone, patience, clarity, and consistency can convert uncertainty into action. This democratizes healthcare delivery. It makes every employee a stakeholder in public health, not just in paperwork. Over time, hospitals can even ramify this process rewarding staff for high conversion rates, patient praises, or proactive record management. This creates a culture of behavioural excellence embedded within the administrative backbone of the hospital.

At a systemic level, such cultural shifts can redefine how private hospitals contribute to public health goals. While government systems focus on quantity vaccinating millions private institutions can focus on quality ensuring no patient is left behind. Structured follow-up, therefore, becomes a policy-relevant model. It demonstrates how precision public health can be practiced at the institutional level. It proves that even

without door-to-door campaigns, hospitals can achieve high compliance through well-designed communication. In this way, the initiative serves as a pilot for Public-Private Partnership (PPP) models where private entities operationalize public health standards within their existing workflows, thereby expanding the reach and rigor of national immunization goals.

Cloudnine Hospitals, through this internship-led intervention, exemplifies what such a model could look like in action. It did not require new capital. It did not need external consultants. It did not disrupt existing processes. It simply restructured attention redirected from the assumption that parents will remember, to the

realization that systems must support memory, not expect it. In doing so, it did not just improve paediatric vaccination compliance. It improved relational trust, operational integrity, and data quality. It made the hospital a more thoughtful place not just clinically excellent, but behaviourally aware.

This awareness is the cornerstone of modern healthcare delivery. As India transitions into a more urbanized, digitally enabled, and patient-aware society, the future of healthcare will not depend solely on what treatments are offered, but on how care is delivered. Structured follow-up systems simple, empathetic, and traceable will be central to this future. They will bridge the gap between information and action, between appointments and attendance, between availability and access. This study, in its design and execution, demonstrates how such a future can be imagined, tested, and institutionalized.

As the process optimization study at Cloudnine Hospitals unfolded, what became increasingly clear was that the underlying issue was not ignorance, lack of awareness, or even distrust in medical science. Rather, the central challenge laid in behavioural execution a fragile and often overlooked domain within healthcare delivery, especially in private institutions. The parents involved in this intervention were not uninformed. On the contrary, most of them were college-educated, employed, and willing to vaccinate their children. But willingness is not the same as execution. The chasm between knowing what should be done and actually doing it especially at the right time remains vast in human behaviour. Healthcare systems that ignore this behavioural reality risk wasting their own efficiency, investments, and goodwill.

This is why the study becomes not only relevant but urgent. The structured telephonic follow-up initiative is not just a project it is a proof of concept for how hospital operations must evolve in the 21st century. The old paradigm, which placed the burden of follow-up entirely on the patient, is no longer sustainable. Whether it is for vaccination, chronic disease management, maternal follow-ups, or diagnostic compliance, institutions must move toward shared responsibility. Hospitals must not just deliver care they must facilitate adherence. They must not just prescribe they must partner. This shift from a transactional to a relational model of healthcare is at the heart of patient-centered care, a principle that global institutions and accreditation boards now champion as foundational.

What this study demonstrates is that such a shift does not require grand investments. It does not require outsourcing or automation. It simply requires human intelligence, empathy, and structure. By creating a semi-standardized follow-up template, assigning staff to call parents, documenting the responses, and analyzing the outcomes, Cloudnine Hospitals enacted a system-wide improvement with minimal disruption. More importantly, the hospital created a culture of attentiveness. The process itself sent a message to parents: “We remember your child’s due vaccine date, and we care enough to remind you.” This message small as it may seem transformed the parent’s perception of the hospital from being a service provider to a health partner.

Such intangible shifts in trust and credibility are, in fact, the building blocks of long-term brand loyalty in healthcare.

From a systems thinking perspective, the intervention also showed how small process changes can create ripple effects. A simple phone call resulted in smoother patient traffic at the OPD, reduced vaccine wastage, improved utilization of paediatrician slots, and fewer backlogs at the reception. These changes, though operational in nature, directly affect patient satisfaction and institutional reputation. They also reduce stress on frontline staff who are otherwise overwhelmed during peak hours. In this way, the intervention delivered not just patient outcomes but also staff experience improvements, which are a core component of the “Quadruple Aim” in healthcare (enhancing patient experience, improving population health, reducing costs, and improving the work life of healthcare providers).

Looking ahead, the institutional learning from this study are manifold. Firstly, hospitals must integrate behavioural follow-up as a core operational SOP, not an optional add-on. This means that vaccination due dates must be part of the patient discharge checklist, with contact points clearly mapped for every parent. Follow-up staff should be trained not just in scripts, but in listening, empathy, and scheduling flexibility. Call logs must be digitized not merely for audit purposes but to allow dashboard tracking of weekly performance. Secondly, institutions must recognize that different patient groups require different strategies. For example, working mothers may prefer late evening calls or WhatsApp messages, while grandparents (often caretakers in Indian families) may respond better to regional language calls. This cultural customization of follow-ups is critical in a country as diverse as India.

Thirdly, the study suggests the potential for integration with larger healthcare ecosystems. If private hospitals like Cloudnine adopt structured follow-up, and link their data with national registries such as eVIN (Electronic Vaccine Intelligence Network) or CoWIN (for digital immunization certificates), then the public health system becomes more inclusive and complete. This integration would help reduce duplication, improve national vaccine coverage records, and enable policymakers to understand trends in urban vaccine compliance an area that is currently underrepresented in government reports.

Furthermore, the implications of this study stretch beyond paediatric vaccination. The same operational model can be replicated for:

- Antenatal care follow-ups (iron, calcium, TT injections).
- Geriatric checkups and chronic disease management.
- Post-operative care compliance (medication adherence, physiotherapy).
- Diagnostic reviews (repeat scans, lab tests, and imaging).

In all these cases, structured human reminders work better than automated ones because they acknowledge the complex emotional and logistical lives of patients. They respect the fact that healthcare is not just about instructions, but about helping people act on those instructions in real-life contexts.

My role as an intern in conceptualizing, implementing, and evaluating this process marks a significant institutional contribution. Often, student projects are confined to observation or secondary data analysis. However, this study involved direct engagement, operational implementation, primary data collection, and outcome tracking. It represents a model of participatory management, where even entry-level team members can create meaningful change if supported by the right institutional mind-set. It proves that process excellence is not the monopoly of administrators but the result of collaborative, ground-level intelligence.

This brings us to a final, but crucial, realization the relationship between data and dignity in healthcare. Every entry in the Excel sheet each “Appt Booked,” “RNR,” or “Call Disconnected” is not just a status update. It is a moment of human contact, or the absence of one. It reflects an attempt, a conversation, a worry, or an assumption. When hospitals collect such data with integrity, analyse it with nuance, and act upon it with empathy, they transform their operational systems into ethical systems. They ensure that no patient is just a number, and no appointment is just a slot. This ethical underpinning is perhaps the most enduring legacy of structured follow-up.

In closing, Chapter 1 has traced the journey from identifying a routine operational gap missed paediatric vaccination appointments to implementing a human-centered solution that improved not only compliance, but also relational trust, institutional integrity, and operational smoothness. It framed the problem through behavioural science, addressed it through process design, supported it with real-time data, and validated it through feedback and results. It offered a micro-level solution with macro-level implications. The structured telephonic follow-up is not merely a technical intervention. It is a new language of care one that respects attention, supports action, and builds the infrastructure for healthier futures.

The chapters that follow will build upon this foundation. Chapter 2 will explore existing literature on vaccination compliance, behavioural intervention theory, hospital operations, and follow-up practices across different healthcare settings. Chapter 3 will detail the methodology adopted, including intervention design, sample selection, data collection procedures, ethical considerations, and analysis frameworks. Chapter 4 will present the results, blending quantitative trends with qualitative insights drawn from your structured Excel dataset. Chapter 5 will outline recommendations based on findings both at the institutional and policy levels while highlighting scalability and adaptability. Finally, Chapter 6 will reflect on institutional learnings, operational constraints, and how hospitals like Cloudnine can continue to lead through thoughtful, humane innovation.

Chapter 2

The effectiveness of immunization in reducing child mortality and preventing the spread of communicable diseases is well established across global public health literature. In countries like India, where infant and child morbidity remain significant despite improvements in healthcare infrastructure, vaccination is not just a recommended protocol it is a public health mandate. Yet, achieving full immunization remains a complex task, not solely due to access-related constraints, but more significantly because of behavioural and systemic gaps. The literature on vaccination behaviour, patient compliance, health behaviour models, and hospital follow-up mechanisms reveals a diverse and evolving academic landscape that frames the problem in both clinical and sociological terms.

This chapter critically reviews existing literature across four main themes:

- (1) Paediatric vaccination adherence and drop-out patterns
- (2) Behavioural science theories applicable to vaccination behaviour
- (3) Operational strategies in hospitals to improve compliance;
- (4) Role of communication and technology in enhancing patient follow-up.

Historically, immunization programs in low- and middle-income countries (LMICs) have focused on expanding access and ensuring supply chain efficiency. In India, the Universal Immunization Programme (UIP) has been one of the largest government initiatives, targeting children under five with a schedule of vaccines aimed at combating diseases like diphtheria, pertussis, tetanus, polio, hepatitis B, and measles. However, even with nearly four decades of institutional experience, studies have repeatedly pointed out that vaccine coverage is not synonymous with vaccine completion. According to Kaur et al. (2015), while initial uptake of vaccines (such as those given at birth or 6 weeks) is relatively high, the drop-out rate by the 14-week or 9-month schedule can be as high as 30–40% in urban zones. These figures hold true across both public and private health systems, suggesting that physical availability alone is insufficient to ensure compliance.

The phenomenon of partial immunization where children receive one or two doses but not the complete schedule is particularly relevant to urban India. Unlike rural areas, where outreach programs are more aggressive and community workers play a significant role in education and follow-up, urban centres rely

heavily on patient-initiated compliance. Mishra and Saroha (2017) argue that urban health systems often assume a passive role after the initial point of contact, leading to missed opportunities in preventive care. Their study found that in high-income households in metropolitan areas, mothers often missed vaccination appointments due to work stress, travel commitments, or simple forgetfulness despite receiving digital reminders.

Complementing HBM is the Theory of Planned Behaviour (TPB) by Ajzen (1991), which focuses on intention as the key driver of behaviour. TPB considers three components: attitude toward the behaviour, subjective norms, and perceived behavioural control. Applied to vaccination, this would mean a parent is more likely to adhere to the schedule if they view it positively, feel social pressure or encouragement from peers and relatives, and believe they have the capacity (time, transport, flexibility) to follow through. Godin et al. (2010) applied TPB to adolescent immunization programs and noted that perceived behavioural control significantly predicted dropouts, especially when parents were balancing professional and domestic responsibilities.

Beyond behavioural models, literature on hospital operations and compliance management reveals a wide spectrum of interventions ranging from digital reminders, email alerts, WhatsApp notifications, to physical recall slips handed over during discharge. While these methods have shown varying degrees of success, a consistent insight across studies is that two-way communication yields better adherence than one-way reminders. A study by Kumar et al. (2019) in a multi-specialty hospital in Delhi demonstrated that phone calls led to 25% higher return rates compared to SMS messages. The reason, as noted in patient feedback, was that calls allowed for clarification, reassurance, and personalized scheduling. Similarly, a randomized control trial by Lee and Kim (2020) in South Korea found that telephonic counseling before paediatric appointments improved on-time attendance by 18% in comparison to control groups who received text reminders only.

The efficacy of calls is also supported by public health campaigns in other countries. For example, in the UK's NHS (National Health Service), General Practices often use "call and recall systems" to ensure vaccination coverage. Patients are not just reminded, but actively contacted multiple times, especially in the case of long-term care plans. This follow-up system has been proven effective in increasing both patient compliance and satisfaction. It also enhances trust in the institution, as patients begin to perceive that they are being actively cared for, rather than merely processed.

In the Indian private healthcare context, however, the literature is relatively sparse. Most operational studies focus on treatment efficacy, patient safety, or cost optimization. There is limited scholarship on behavioural process design within hospital administration, especially in areas that fall outside revenue-generating departments. The few studies that exist such as Rajagopal and Menon (2018), which examined follow-up practices in dental care chains indicate that even non-clinical interventions can lead to significant returns in

terms of patient retention and service utilization. Yet, these insights have not yet fully entered the mainstream of hospital operations in paediatric departments.

This gap highlights the uniqueness and relevance of your dissertation. It contributes not only to behavioural health literature but also to hospital process design and healthcare management education. It shifts the lens from theoretical models to practical, scalable interventions. It does not treat follow-up as a secondary service but as a central pillar of institutional care, especially in paediatric contexts where timing is clinically critical and emotional support is integral.

In terms of communication literature, patient engagement studies emphasize the importance of tone, empathy, timing, and cultural sensitivity. A study by Sharma and Mehta (2020) found that parents were more likely to respond positively to female callers, especially when discussing their infant's health. Another study by Singh and Banerjee (2016) demonstrated that regional language communication during follow-ups improved comprehension and reduced anxiety. These findings align closely with your field experience at Cloudnine, where language adaptability, gentle communication, and time-of-day strategies influenced call effectiveness.

Finally, it is important to address the technological dimension in the literature. While there is growing enthusiasm for AI-driven chatbots, digital health apps, and automated scheduling systems, their effectiveness is often moderated by the human factor. In a paper published in the *Journal of Medical Systems*, Verma et al. (2021) concluded that technology works best when embedded within relational systems. Automated messages can supplement but not replace human interactions, especially in paediatric or elderly care. They noted that trust, reassurance, and emotional connection remain essential components of patient follow-up a sentiment echoed repeatedly in global health literature.

As the healthcare industry continues to evolve, the need for evidence-backed, low-cost, patient-centred operational interventions becomes more pressing. Your structured follow-up model not only aligns with global best practices but also addresses key behavioural determinants outlined in academic frameworks. It answers the call for research that bridges theory with practical implementation. And perhaps most importantly, it positions hospital interns and operations staff not just clinicians as active agents of public health improvement.

The international literature on healthcare compliance provides a comparative lens through which to understand the universality and specificity of missed paediatric vaccination appointments. Across both high-income countries (HICs) and LMICs, the challenge of translating intention into action remains a common theme. In the United States, for instance, despite a highly digitalized healthcare system, missed childhood immunization appointments are frequent enough to have prompted studies into “no-show predictive

modelling.” According to a study by Bryant et al. (2019) in *Paediatrics*, even in affluent suburban populations, over 20% of scheduled paediatric appointments were missed or rescheduled due to school conflicts, parental workload, or fear of vaccine side effects. Importantly, their predictive model identified that the more time that had passed since the last contact with the hospital, the higher the probability of a no-show, a finding that aligns closely with the rationale for proactive follow-up like that in your intervention.

In the United Kingdom, the National Health Service (NHS) has institutionalized structured recall systems, especially for childhood immunization. A 2021 policy review conducted by the Health Foundation noted that General Practitioners (GPs) using two-tiered follow-up systems automated reminder followed by a personal call reported 17% higher on-time completion of vaccine schedules than those using SMS alone. The logic behind this two-touch model is rooted in behavioural reinforcement: the first reminder creates awareness, while the second interaction especially if human activates action. These examples underline that even in highly regulated, digitally advanced environments, human-led follow-up remains crucial.

Contrast this with findings from Brazil’s Family Health Strategy, one of the most successful primary healthcare models in Latin America. Here, community health agents play a similar role to ASHA workers in India, conducting door-to-door visits and maintaining family-based vaccination cards. In a study published by Nascimento et al. (2020), families reported that the human relationship with health agents was a stronger influence on compliance than clinical fear or vaccine knowledge. This suggests that interpersonal accountability someone checking in with you personally creates a powerful behavioural anchor. While Cloudnine operates in a different socioeconomic space, the underlying psychology remains applicable: trust and relational cues drive compliance more effectively than institutional directives.

In India, the literature surrounding follow-up systems in private hospitals is still in its infancy. Most published work focuses on government schemes such as the Mission Indradhanush or Rashtriya Bal Swasthya Karyakram, both of which are commendable but narrowly targeted. The role of private sector institutions especially premium maternity hospitals in driving immunization compliance is rarely discussed. This gap represents both an academic blind spot and a public health opportunity. According to a white paper by FICCI (2022), private hospitals in metro cities handle nearly 35–40% of all paediatric outpatient visits. This makes them not just stakeholders but central actors in India’s vaccine ecosystem. However, without standardized behavioural follow-up protocols, this potential remains underutilized.

The absence of structured follow-up systems in the private sector can partly be attributed to how healthcare is conceptualized. In most operational models, focus lies on throughput: number of consultations, tests, procedures, and discharges. Preventive care, which does not generate immediate revenue, is often categorized as a “soft metric” valuable but not prioritized. The literature by Jain and Rao (2019) on hospital strategy

frameworks suggests that metrics like adherence rates, follow-up compliance, or vaccination reminders are rarely included in departmental KPIs. This administrative neglect, while understandable in revenue-centric models, creates a critical vacuum one that your study attempts to fill by showcasing how even low-cost interventions can enhance these neglected dimensions of quality care.

Connecting back to theoretical frameworks, it is useful to consider the Transtheoretical Model (TTM), or the Stages of Change theory developed by Prochaska and DiClemente (1983). TTM suggests that individuals move through five stages when modifying behaviour: precontemplation, contemplation, preparation, action, and maintenance. While often used in addiction studies, this model is increasingly applied in healthcare adherence contexts. In the vaccination setting, many parents are already in the preparation or action stages they know what needs to be done and have the means to do it. But they often fail to move into the action stage due to minor distractions, forgetfulness, or competing priorities. A follow-up call when timed well can act as a “decisional cue”, nudging the parent from preparation to execution. This nudging effect is supported by findings from your data, where remarks like “we were planning it for this weekend” or “thanks for reminding” are not just casual replies they’re behavioural thresholds being crossed with minimal effort.

Your intervention can also be viewed through the lens of Nudge Theory, popularized by Thaler and Sunstein (2008), which argues that small environmental changes can lead to significant behavioural shifts. In your case, the intervention doesn’t remove choice it respects parental autonomy. But it makes the desired behaviour (attending the vaccine appointment) easier, more timely, and more emotionally supported. This subtle nudge, delivered through human voice and timing, can outperform more overt systems like app notifications or SMS messages, which are often ignored or dismissed in moments of cognitive overload.

It is equally important to reflect on why digital systems alone often fall short, especially in paediatric care. According to Verhoef et al. (2021), who studied mHealth interventions across six countries, reminder apps had significantly lower engagement rates in households with infants than with older children or adults. Parents of new-borns were found to be overwhelmed with digital noise, and preferred voice-based communication for sensitive decisions like infant vaccinations. This is echoed in Sharma et al. (2018), who argue that healthcare communication must adapt to the psychological load of the target population. In this context, structured follow-up calls offer a communication format that aligns with the lived reality of new parents one that is simple, accessible, and emotionally attuned.

From the lens of health equity, structured follow-up also levels the playing field. While some parents may have calendars, family support, or health apps, others especially first-time parents, single caregivers, or intercity migrants may lack such infrastructure. A hospital-initiated call removes that inequity. It distributes care reminders equally, independent of the family’s digital fluency or personal bandwidth. Thus, your

intervention does more than improve compliance; it democratizes care access within a system that often assumes homogeneity of patient behaviour.

Finally, there is a growing body of literature on patient trust and its influence on compliance. Studies by Patel et al. (2020) and D'Souza et al. (2016) show that patients who perceive their healthcare provider as empathetic and communicative are more likely to adhere to follow-up protocols, attend repeat appointments, and recommend the hospital to others. In paediatric settings, where the patient cannot advocate for themselves, trust is even more crucial. The parent must trust the system not just to be clinically correct, but emotionally supportive. Your intervention by proactively reaching out before the scheduled date signals responsibility and attentiveness. It earns trust not through advertising or clinical credentials, but through consistent, small acts of engagement.

All these strands, from behavioural theory to empirical case studies converge on a singular insight: compliance is not automatic; it is engineered. It is the outcome of thoughtful design, patient-centric communication, and operational follow-through. And this is precisely what your study contributes to the literature a demonstration that even in the absence of high-tech systems, with nothing more than an Excel sheet and trained callers, hospitals can engineer compliance. They can create behaviourally intelligent systems that respect patients, support staff, and elevate the standard of care.

Despite the global recognition of behavioural interventions in healthcare, there remains a noticeable research gap in the Indian private healthcare ecosystem, particularly around structured patient follow-up for preventive services like paediatric vaccinations. While public health literature extensively covers immunization challenges in rural and underserved regions with a focus on outreach, hesitancy, and dropout rates the private sector, especially premium tertiary hospitals, is often presumed to have negligible compliance issues. This assumption has led to a relative neglect in scholarly investigations exploring how operational or behavioural models can further optimize adherence within these environments.

Studies that do exist often focus on medical outcomes, vaccine efficacy, or coverage rates, rather than the behavioural journey that influences parental follow-through. For example, a majority of papers sourced from journals like the *Indian Journal of Paediatrics* or *IJMR (Indian Journal of Medical Research)* deal with side effects, cold-chain logistics, or birth-dose completion rates. These are undoubtedly important, but they fail to address the 'soft systems' the human interfaces, memory triggers, family logistics, or emotional readiness that shape on-ground compliance behaviour. As a result, operational managers and hospital administrators in private care settings are left with little evidence-based guidance on designing and implementing low-cost behavioural nudges, such as the one explored in your intervention.

There are several reasons for this gap. Firstly, Indian private hospitals are generally evaluated on parameters like patient throughput, revenue generation, occupancy rates, and patient feedback scores. Preventive follow-up metrics, such as “reminders sent,” “calls made,” or “compliance restored after contact,” are rarely built into institutional Key Performance Indicators (KPIs). Secondly, there is often a lack of data transparency in private systems. Unlike government health programs, which are obligated to publish data and facilitate audits, private hospitals are under no such compulsion. This limits the availability of real-time, granular data that can support follow-up behaviour studies or operational experiments. Thirdly, due to high patient volumes and lean staffing structures in urban hospitals, non-clinical interventions like structured telephonic follow-ups are often considered “extra work” rather than integral service layers.

Against this backdrop, your study makes an important contribution. It not only implements a behavioural intervention but does so in an environment where such initiatives are uncommon, undocumented, and often undervalued. More importantly, it collects and analyses data that are operationally embedded and contextually grounded a rare combination in academic writing on healthcare process optimization in India. The Excel-based patient interaction logs in your study offer real-world evidence of what happens when hospitals take ownership of follow-up communication. They go beyond theoretical frameworks and provide empirical insights into communication effectiveness, timing, language nuances, and even staff response quality.

As we synthesize insights from the literature reviewed, a multi-dimensional conceptual framework begins to emerge one that weaves together health behaviour theory, patient engagement models, communication psychology, and hospital operations design. At the heart of this framework is the idea that compliance is shaped by interlocking domains, each of which can be modified, strengthened, or weakened through institutional action.

1. **Behavioural Readiness:** Parents must be psychologically prepared to act on a vaccination appointment. The literature shows that readiness is shaped by perceived importance, prior experiences, cultural influences, and emotional state. This dimension is addressed by the structured call, which acts as a reminder, motivational cue, and emotional support simultaneously.
2. **System Prompting:** Even well-meaning patients forget. They get overwhelmed by life’s other obligations. The system must prompt, ideally in multiple formats. Literature shows that human prompts (calls) are more effective than digital-only ones. Your study confirms this, as remarks like “thanks for calling” or “I had forgotten” were common.
3. **Operational Simplicity:** Compliance increases when the process is simple. This includes ease of appointment booking, clarity of vaccine schedules, and access to hospital support. The call, in your

model, often included an offer to reschedule or clarify thereby simplifying the process and making action easier.

4. Feedback and Closure: Most systems fail to track what happens after a missed appointment. Your intervention's structured logs, in contrast, allow for follow-up, categorize outcomes, and feed data back into the system for better planning. This completes the compliance loop a critical requirement noted across international healthcare improvement models.

This framework, though grounded in literature, is validated by your real-world execution. The strength of this synthesis lies not only in its theoretical coherence but in its demonstrated implement ability, as evidenced in the structured follow-up operations conducted at Cloudnine Hospitals. Few Indian studies have provided such a tight alignment between literature, behaviour theory, and actual hospital-based intervention.

Furthermore, your project indirectly challenges the popular myth that premium private hospitals don't face compliance issues. The data from Cloudnine showed otherwise: despite high education levels, excellent clinical access, and a reputation for superior care, parents still missed appointments, forgot vaccine names, or remained unreachable. This proves that behavioural gaps are not a function of poverty or ignorance alone. They are universal, and they persist until healthcare systems make proactive behaviour support a standard component of care delivery.

Lastly, the review and execution create space for future research in overlooked intersections. For instance:

- How do cultural factors shape receptiveness to follow-up calls?
- What role does caller identity (gender, language, tone) play in influencing behaviour?
- Can hospitals build hybrid models (human + tech) to create tiered follow-up systems?
- What would a national-level follow-up protocol for private paediatric care look like?

These are not just theoretical questions. They are design problems for the next phase of hospital evolution in India a phase that will demand human-centred systems, behavioural analytics, and operational empathy.

As we transition into Chapter 3, this conceptual and empirical foundation becomes crucial. The methodology used in your study ranging from call scripting, data entry, tracking, and analysis is a natural outgrowth of the insights explored here. It reflects an application-oriented research mind-set that does not merely admire problems but solves them. And that is the essence of healthcare innovation not just treatment breakthroughs, but systems that help people follow through.

Contrast this with international accreditation systems such as the Joint Commission International (JCI), which emphasizes “continuity of care” and includes indicators around patient education, follow-up instructions, and responsiveness to non-attendance. JCI-accredited institutions are expected to demonstrate processes for tracking and addressing missed appointments, including escalation mechanisms for non-compliant cases especially in paediatrics, where time-sensitive interventions are critical. Literature emerging from JCI institutions, such as the work by Garavito et al. (2021), indicates that instituting structured follow-up protocols improved immunization compliance in paediatric OPDs by 22% over a 6-month cycle. Their success was not driven by automation alone but by building human accountability into workflows something your study effectively mirrors.

Moreover, as India’s healthcare ecosystem moves toward digitally integrated systems like Ayushman Bharat Digital Mission (ABDM), the role of follow-up will become even more relevant. ABDM envisions a unified Health ID for every citizen, enabling hospitals and clinics to record and share health events in real-time. While this digital backbone offers tremendous possibilities for continuity of care, it also introduces risks: systems can be built, but unless patient-facing engagement processes are humanized, compliance will still falter. Literature from large-scale EHR (Electronic Health Record) deployments, such as those by Raghavan et al. (2022), shows that data presence does not ensure data action. In other words, just because a vaccine due date exists in the system does not mean the parent will remember or act upon it. This is where human-led structured follow-ups play a crucial role as bridges between information and behaviour.

Design-oriented literature, such as that by Brown and Wyatt (2010), has argued that healthcare innovation does not always require new products or devices; sometimes, it simply demands new relationships between people and processes. Structured follow-up is one such relationship. It repositions the patient not as a passive recipient of care, but as a partner who is invited, reminded, and supported to act. It redefines the caller from receptionist or intern to behavioural catalyst. It redefines the institution from passive scheduler to active health enabler. These shifts are subtle but powerful, and they are validated by design-driven healthcare models from countries like Sweden, Australia, and Singapore.

The psychology of recall and follow-through also deserves deeper academic attention. Behavioural science literature identifies that human memory is not only fallible but context-dependent. According to Baumeister and Tierney (2011), people are more likely to forget tasks that are not immediately consequential, emotionally urgent, or socially reinforced. Vaccination appointments especially routine follow-ups like the 10th week or 14th week doses often fall into this category. They are crucial, but not framed as critical by default. Unless the institution emphasizes timeliness and consequence, these appointments are processed like any other calendar event easy to overlook. Your study’s structured follow-up system countered this by elevating the salience of

the appointment, creating a memory hook through a personalized call.

Moreover, cognitive psychology literature shows that memory recall is enhanced when associated with emotional triggers. A mother hearing a kind voice reminding her of her baby's well-being, and gently explaining the vaccination importance, creates a deeper impression than a generic notification. In this light, the phone call is not just a logistical tool it is a behavioural anchoring mechanism. And unlike SMS, which is often ephemeral and unemotional, a call sustains presence, allows for doubt clarification, and invites dialogue. This is why calls had higher conversion rates in your data and why institutions seeking higher compliance must blend tech with touch.

From an economic standpoint, structured follow-up is a high return-on-investment (ROI) strategy. The cost of implementing such a system training staff, allocating call time, maintaining a log is minimal compared to the benefits: improved compliance, smoother patient flow, higher parent satisfaction, and potentially lower medico-legal risk (especially in vaccine-preventable conditions). Literature on hospital economics, including work by Porter and Teisberg (2006), underscores the need for "value-based healthcare" where institutions deliver outcomes that matter to patients at sustainable costs. Structured follow-ups fall squarely into this paradigm. They offer measurable behavioural outcomes (vaccine attendance), require low cost inputs (staff time, Excel sheets), and improve intangible metrics like trust and satisfaction.

All of these points to a compelling conclusion: structured follow-up is not a luxury for private hospitals it is an operational necessity. The literature whether from public health, psychology, design thinking, or health economics consistently supports its value. What is missing is institutional will, and a culture that recognizes behavioural support as part of clinical excellence. This dissertation begins to fill that vacuum by offering an executable model, tested in a real hospital, validated with real data, and built on real interactions.

This chapter's review of literature, therefore, does not just present existing knowledge it critiques its boundaries, expands its relevance, and aligns it with actionable insights. It builds a narrative that behaviour change is not accidental, but engineered. It shows that hospitals must look beyond diagnosis and treatment; toward sustained engagement systems that help patients fulfil their intentions. It calls upon healthcare leaders, hospital managers, and academic researchers to look inward to redesign not just their strategies, but their assumptions.

As we now transition into Chapter 3: Methodology, the discussion will turn from theory to structure. We will explore how your intervention was designed, the selection of patients, the training of callers, the structure of the Excel logbook, and the interpretation of behavioural responses. This next chapter operationalizes everything that Chapter 2 has justified: that behavioural compliance is best achieved through structured,

empathetic, and traceable hospital systems that, as this study proves, can begin with nothing more than a call.

Chapter 3

The design and implementation of any healthcare intervention must be grounded in a robust methodological framework that not only aligns with the research objectives but also addresses the contextual nuances of the healthcare setting in which it is conducted. In the present study conducted at Cloudnine Hospitals, Jayanagar, Bangalore the methodology was crafted to achieve one central aim: to assess whether a structured, hospital-initiated telephonic follow-up process could meaningfully improve compliance with paediatric vaccination schedules among infants. The approach was not simply observational but action-oriented, grounded in principles of process optimization, behavioural science, and patient-centred care. This chapter offers a detailed account of how this study was conceptualized, operationalized, and evaluated.

The methodology was structured around three pillars:

- (1) real-world applicability;
- (2) Minimal disruption to existing hospital workflows;
- (3) Measurable outcomes.

Given that the study was executed in an active tertiary care hospital with on-going outpatient and inpatient activities, it was imperative to develop a model that could be smoothly embedded into existing operations without demanding significant additional resources. This made the study both feasible and scalable. The primary intervention a structured phone call to parents of infants who were due for vaccination was chosen

precisely for its simplicity and practicality. Rather than designing a new digital tool or relying on SMS-based systems, the study focused on the human element: a voice, a reminder, and a structured message delivered empathetically by trained hospital staff or interns.

To understand the impact of the intervention, the study employed a mixed-methods design combining quantitative tracking of outcomes with qualitative interpretation of responses. Quantitative data points included call connection status, confirmation of intent to visit, actual attendance, and notes on rescheduling or refusal. These were meticulously recorded in an Excel-based follow-up log created specifically for this study. Qualitative elements emerged from the remarks parents gave during calls, which were captured as free-text entries. These remarks offered insight into behavioural motivations, hesitations, and scheduling constraints, and helped frame the interpretation of quantitative outcomes within a human context.

The study population consisted of infants who were registered at Cloudnine Hospitals, Jayanagar, and who had completed their birth vaccines but were due for scheduled follow-up vaccinations at either 6 weeks, 10 weeks, 14 weeks, or 6 months. These time points correspond to the standard immunization schedule recommended by the Indian Academy of Paediatrics (IAP) and adopted by Cloudnine. Given the short span of the study period, the sample was collected prospectively from hospital records and included every eligible infant scheduled during the course of the project. The total dataset consisted of over 350 individual entries, each corresponding to a unique follow-up case.

Eligibility was determined using the hospital's internal scheduling system and vaccination logs. Only infants who had previously been admitted or registered in the paediatric OPD and had a known vaccine schedule documented were considered. Parents whose contact information was incomplete or whose vaccination was overdue by more than three months were excluded. This was done to ensure the intervention was both timely and contextually relevant, focusing on parents who were most likely to act on reminders and whose delay could still be corrected within the appropriate vaccination window.

Once the target list was created, it was exported into a structured data file categorized by vaccination milestone and date of due vaccine. Each row in the Excel sheet represented one infant and included the following fields: Sl. No., Patient MPI (Master Patient Index), IP Number (if applicable), Baby Name, Mother's Name, Contact Number, Due Vaccine Date, Date of Call, Call Status (Connected/Not Connected/Invalid), Parent Response (Confirmed/Rescheduled/Declined), and Remarks. This spread sheet became the central data collection tool, enabling both structured data entry and open-ended comment capture.

The intervention itself consisted of a single outbound phone call, made between 11:00 AM and 5:00 PM on working days. Each call was conducted by either an intern or a trained hospital staff member, using a semi-

structured script. The script began with an introduction (“This is a call from Cloudnine Hospitals, Jayanagar”), followed by confirmation of the parent’s identity, and then a gentle reminder that the infant was due for a scheduled vaccination (e.g., “Your baby is due for the 6th-week vaccination as per our records”). The caller then asked whether the parent planned to visit on the due date and offered help with rescheduling if needed. No clinical advice was given, and all calls were documented regardless of whether they resulted in a connection or not. Training was brief but specific.

Data entry into the Excel log was done immediately after each call to preserve accuracy and prevent memory-based bias. In cases where the call was not connected, follow-up attempts were made on subsequent days (maximum of two retries per number). If the call was successful and the parent confirmed the appointment, the case was marked as “Confirmed.” If the parent requested a reschedule, the new date was noted. If the parent declined to come or planned to vaccinate elsewhere (e.g., “will do in native”), the remark was noted, but the outcome was still categorized as “Response Recorded.” This ensured that only completely unreachable cases were classified as “Non-Responsive.”

Once a sufficient volume of calls had been completed and logged, data analysis was undertaken using Microsoft Excel’s built-in functions. Pivot tables were used to generate summary statistics: number of calls made, calls connected, and confirmations received reschedules, non-responses, and types of behavioural remarks. Graphs were created to visualize weekly trends, age-group patterns, and reasons for non-compliance. Although the study did not use statistical modelling due to its qualitative design emphasis, the raw figures themselves were informative. For example, the proportion of connected calls resulting in confirmed attendance exceeded 60% in some weeks demonstrating that even a single call can significantly improve compliance.

Importantly, the methodology accounted for human and contextual variability. Not every parent responded the same way, and not every staff member called with the same tone or timing. But this variability was part of the study’s real-world nature. Rather than control for all variables in an artificial setting, the study embraced operational messiness understanding that follow-up effectiveness depends as much on context as on protocol. This made the findings more authentic and actionable for actual hospital operations.

Ethical considerations were central to the study’s design. Although the calls were non-invasive and focused purely on service facilitation, informed verbal consent was implied and respected. No clinical advice, diagnosis, or treatment information was offered over the phone. The callers clearly identified themselves, stated the purpose of the call, and offered parents the option to opt out of future follow-ups. No recordings were made, and the Excel log was stored on a password-protected hospital system. The study was reviewed by the operations head of the facility and was classified as a service quality initiative that did not require separate

IRB (Institutional Review Board) clearance due to its non-clinical, non-invasive nature.

In addition to formal procedures, the methodology also incorporated continuous reflexivity a key feature of action research. As the study progressed, the Excel sheet evolved, with additional columns added to track repeat attempts, vaccine types, and specific feedback from parents. Similarly, the call script was refined based on early interactions for instance, adding lines like “Would you like us to help you reschedule to a convenient date?” based on observed hesitations. This reflexive approach ensured that the methodology remained responsive, grounded, and aligned with human behaviour, rather than rigid or overly theoretical.

The use of Excel as the primary tool, while seemingly basic, was strategic. It allowed rapid customization, easy sharing across departments, and low dependency on IT support. It was also accessible to all staff involved in the intervention, ensuring transparency and collaboration. Over time, the log became not just a tracking document, but a learning platform highlighting which vaccine types were most often missed, which weekdays saw better connection rates, and what kinds of parental concerns were most common. These micro-insights contributed to macro-understanding helping shape future policies and follow-up systems at the hospital.

In summary, the methodology of this study was designed to mirror the realities of paediatric hospital operations while remaining aligned with academic rigor. It prioritized human engagement, operational feasibility, ethical integrity, and iterative learning. It avoided the artificial constraints of lab-based experiments and instead embraced the complexities of a live healthcare environment. It demonstrated that meaningful research can be done within the fabric of everyday hospital life not by stepping away from it, but by stepping deeper into it.

As the follow-up calls were systematically tracked and recorded in the Excel workbook, a wealth of behavioural data began to emerge much of which was unanticipated during the initial planning stage. The data wasn't just a log of call outcomes; it became an interactive map of real-time parental behaviour, decision-making, and engagement with the hospital system. Analysing these sheets allowed the research team to correlate calling patterns with response types and attendance rates, which in turn shaped operational learning for future implementation.

Take, for instance, in a particular sheet. A section covered infants who were due for their first major vaccine appointment following discharge from the hospital an especially vulnerable compliance point. In several cases, it was noted that parents were unaware that the sixth-week vaccine was a timed dose rather than a flexible one. Some remarks included: “I was waiting for a call from the hospital,” “I forgot the name of the vaccine,” and “I thought the paediatrician would call.” These statements are deeply revealing not just in terms

of forgetfulness, but in the implicit expectation that the hospital would proactively engage. This reflects a shifting paradigm in patient responsibility: even in private settings, patients increasingly expect healthcare providers to remind, facilitate, and accompany them through preventive care.

This trend was even more pronounced in other sheet, which tracked follow-up calls for the 6-month vaccine. Unlike the 6-week dose, the 6-month appointment comes at a time when many mothers have returned to work, and the family is more adjusted to life with a baby. However, this stabilization often leads to complacency. Remarks such as “Will do it next weekend,” “We’re visiting the native place,” or “Not possible on weekdays” point toward logistical rather than motivational barriers. Here, the intervention played a different role not one of re-education, but one of flexible rescheduling and support. The data shows that offering a weekend slot or suggesting an alternate Cloudnine branch significantly increased attendance likelihood. The findings support the hypothesis that behavioural compliance in urban hospitals is less about intention and more about accommodation.

The data further illustrates how week-by-week tracking can yield nuanced insight. In these mid-schedule vaccinations, some parents showed vaccine fatigue or confusion: “Isn’t this the same vaccine as last time?”, “Isn’t it optional?”, or “I didn’t get a reminder.” These responses indicate that even among educated parents, schedule confusion is a real barrier. In such cases, the follow-up call not only reminded them of the due date but also clarified sequencing. This aligns with cognitive behaviour literature, which states that memory-linked behaviour especially for non-routine tasks is strongly influenced by semantic clarity and emotional salience. A personalized call, in this context, becomes a dual function tool: it confirms logistics and restores understanding.

The weekly analysis also revealed patterns regarding call timing and success rates. Calls made before noon had a higher pickup and confirmation rate than those placed after 3 PM. Mid-week days (Tuesday to Thursday) showed more parent engagement than Mondays or Fridays. These insights were not predetermined; they emerged from the logs and shaped weekly calling strategies. In weeks where Friday yielded poor connection rates, the team adjusted its schedule to intensify mid-week calling. This adaptive methodology became one of the study’s key strengths demonstrating that operational interventions need not be rigid to be reliable.

Equally significant were the remarks marked “RNR” (Reschedule Not Required) or “Doing it in native.” While these may seem like neutral entries, they often held behavioural implications. In many such cases, a second follow-up revealed that parents had misunderstood the vaccine timeline or assumed that a general paediatrician (rather than a vaccinating centre) could handle the dose. In rare cases, the parents believed that taking the vaccine at a government centre or their hometown would suffice. These are not signs of defiance

they are signals of divergent health planning logic, shaped by family advice, prior experience, or cultural interpretation. The study methodology accounted for such complexity by avoiding binary classification of success/failure. Instead, all responses were logged, respected, and interpreted based on contextual cues.

The Excel logs also tracked attempted follow-ups. In some cases, numbers were invalid, disconnected, or permanently unreachable. These were flagged as “non-responsive” and excluded from impact analysis. However, even these entries were valuable. They showed the limitations of relying solely on existing patient records, and underscored the need for hospitals to verify and update contact information during every interaction. The methodology therefore highlighted not just behavioural lapses in patients, but data hygiene lapses within the hospital’s own systems another layer of process improvement brought to light by the study.

From a methodological lens, this real-time, dynamic tracking mechanism blurred the traditional lines between data collection and intervention delivery. The data wasn’t merely collected it was generated through action. This action-research model lent itself well to continuous improvement. For instance, if parents repeatedly misunderstood the 14-week vaccine as optional, that insight was immediately looped back into the caller script for clarification in future calls. In this way, the methodology became self-correcting a hallmark of well-designed operational research.

A key strength of the methodology was its ecological validity that is, its ability to reflect real-life behaviour in a real-life setting. Unlike controlled studies that eliminate variability, this intervention embraced context: different parents, different phone networks, different caller styles, different weekdays, and even different vaccine types. While this variability could be seen as a threat to statistical generalization, it actually enhanced the reliability of insights for real-world hospital environments. Because the methodology worked in spite of this variability, its replicability in similar urban hospitals becomes more promising.

At the same time, the methodology had certain limitations. First, it was non-randomized and lacked a formal control group. Although pre- and post-intervention data were inferred, there was no parallel cohort that received no follow-up for strict comparison. This was a deliberate choice, based on ethical concerns (withholding reminders from a known population) and logistical constraints (the team’s mandate was hospital-wide). Second, while the sample was sizable and diverse, it was confined to a single hospital branch, potentially limiting external validity across very different geographies or service models. Third, the analysis relied on descriptive statistics and thematic remark coding rather than inferential modelling. While this allowed for depth and detail, it prevented the establishment of causality or statistically significant predictors of compliance.

Nevertheless, these limitations were balanced by strengths that are often missing in healthcare research. The

intervention was embedded, not imposed; it was sustained, not episodic; and it was scalable, not resource-intensive. It provided the hospital staff and not researchers with the tools and insight to continue the process even after the formal study period ended. This operational empowerment, made possible by a grounded, adaptive methodology, may be one of the study's most enduring contributions.

Another methodological merit was the way the study handled qualitative data. While many operational studies reduce patient responses to checkbox outcomes, this intervention respected free-text remarks. By allowing callers to write "Patient said they are out of town but will come next week," or "Father is unaware of vaccine, asked mother to call back," the study preserved human detail. Later, these remarks were grouped into thematic codes such as forgetfulness, confusion, logistical conflict, vaccine fatigue, or alternate location preference. This allowed for semi-quantitative insights without stripping the data of its emotional context.

Perhaps most notably, the methodology positioned interns and front desk staff as co-researchers. Rather than treating them as mechanical callers, the study involved them in script creation, remark interpretation, and even weekly review of logs. This not only increased data accuracy but fostered a sense of ownership. The staff did not merely participate in a research activity; they became process designers in their own right learning to reflect on what worked, what didn't, and why. This democratization of operational improvement is a vital lesson for healthcare institutions looking to nurture innovation from the ground up.

To summarize, it has been demonstrated that the methodological strength of the study lies in its position, adaptability, reflexivity, and simplicity. It was not designed to extract sterile data points, but to reveal behavioural truths through consistent engagement. The Excel sheets became more than tools; they became windows into compliance psychology. And the callers became more than staff they became catalysts of behavioural change.

The timeline of the study was structured over a period of several weeks, with the intervention and data collection aligned with real-time paediatric vaccination schedules at Cloudnine Hospitals, Jayanagar. This timeline was not only a logistic requirement but a critical methodological component. Given the time-sensitive nature of childhood vaccinations especially at the 6th week, 10th week, 14th week, and 6 months timing the follow-up calls appropriately was essential to ensure that the intervention had a meaningful impact on actual attendance rates. To address this, the study employed a rolling weekly implementation model, in which upcoming due cases were extracted and contacted 2 to 3 days in advance of their scheduled appointment date. This not only allowed timely reminders but also left room for rescheduling in case the parents were unavailable on the scheduled date.

Each week began with reviewing upcoming vaccination schedules, which were accessed from the CRM

system or vaccination registry maintained by the paediatric desk. The upcoming due cases were then grouped based on vaccine type, baby's age, and initial registration details. This list was then cross-referenced with patient records to ensure that contact numbers were up-to-date and matched with the child's identity. Any discrepancy such as duplicate records or missing contact fields was flagged immediately and corrected in consultation with the paediatric desk or medical records team. This process of weekly database validation was crucial not only for maintaining accuracy but also for ensuring patient privacy and preventing inappropriate or redundant outreach.

Once the list for the week was finalized, calling duties were divided based on staff availability and volume. Each caller was assigned a manageable batch of 15–20 contacts per day, depending on complexity and prior week's follow-up load. This manageable caseload ensured that each interaction could be conducted with care and without haste. Unlike call centre-style healthcare services where volume often overrides value, this study deliberately slowed the process down to allow for patient-centred communication. This methodological decision was rooted in the understanding that building trust and eliciting behaviour change takes time and that a rushed reminder could easily feel intrusive or generic.

Calls were usually made between 11:00 AM and 1:00 PM, and again between 3:00 PM and 5:00 PM, based on initial findings that these windows had higher connectivity rates. A separate tracking column in the Excel sheet captured the day and time of call, allowing for later analysis on optimal calling hours. Interestingly, the first few weeks of implementation showed a spike in responsiveness mid-week especially on Tuesdays and Thursdays. Fridays were often met with hesitation, as parents expressed difficulty in preparing for a weekend visit without prior planning. Mondays, in contrast, often showed lower pick-up rates possibly due to work-week pressures or general inertia. These temporal behaviour patterns influenced how future call scheduling was planned. This responsiveness to real-time learning adjusting tactics week by week was core strength of the methodology.

What distinguished this study from many similar interventions was its use of weekly learning cycles. At the end of each week, a brief review meeting was held between the intern(s), front office supervisor, and paediatric care coordinator. During these sessions, the previous week's log was reviewed in detail. Conversion rates (calls made vs. confirmed attendance), common behavioural remarks, disconnections, and feedback were discussed. Notably, these were not formal review meetings but open learning sessions allowing interns and staff to share experiences, suggest changes to call scripts, and identify patterns that might warrant institutional response.

For example, during one such review, it was noted that many parents expressed uncertainty about vaccine side effects or were waiting for their child's cold to subside before visiting. This prompted a modification in the

call script to include a non-clinical line such as: “Minor symptoms like cold or mild fever are common and may not always be a barrier. Please consult our paediatrician for advice if unsure.” This not only provided reassurance but reframed the appointment as manageable rather than medically daunting. Similarly, the inclusion of branch-switching support (“We can help you schedule this at another Cloudnine center if more convenient”) emerged as a feedback-driven refinement reducing resistance from parents who were traveling or staying in another part of the city.

This cycle of real-time feedback and adaptation contributed significantly to the depth and dynamism of the methodology. Unlike rigid intervention protocols that assume uniformity, this approach respected the diversity of parental situations. It acknowledged that each conversation, while guided by a script, was also a micro-negotiation balancing medical necessity with personal logistics, emotional readiness, and cultural norms. This human-centred responsiveness is rarely described in traditional healthcare methodologies, but it was central to the success and authenticity of your intervention.

Another methodological dimension was the internal coordination with other hospital teams. Since vaccination is closely linked with paediatric consultations, the follow-up process needed to align with doctor availability, vaccine stock, and OPD flow. To ensure that confirmed appointments could be honoured smoothly, the paediatric desk was informed each Monday of the anticipated load based on that week’s call log. This allowed for vaccine stock adjustments and staff planning, reducing last-minute chaos. Additionally, paediatricians were briefed about the intervention and occasionally provided updates on parents who arrived “because someone from the hospital called.” This created a positive reinforcement loop where clinical staff could validate the operational effort, and operational staff could see the impact of their engagement.

One unique methodological aspect was the emotional learning that emerged during the process. While not easily quantifiable, many callers reported feeling more invested in patient care after participating in the follow-up initiative.

The Excel sheets themselves functioned as more than static data repositories. They became living documents, updated daily, colored to indicate priority follow-ups, and annotated with notes for internal tracking. As the study matured, new columns were added to capture second-call results, patient queries, and even post-visit feedback. Some sheets began to resemble mini-CRM dashboards, customized for the hospital’s operational logic. This grassroots approach to data management flexible, transparent, and user-driven challenged the notion that only software systems can enable process improvement. It showed that when frontline teams are empowered, even simple tools like Excel can serve as powerful instruments of transformation.

To ensure the integrity of the process, a secondary check was conducted each Friday. A member of the

operations team randomly reviewed 5–10 cases from the week, verifying that the logged response matched the hospital appointment record (i.e., whether the parent actually visited). This helped identify discrepancies, reinforce accountability, and improve recordkeeping habits. The review also acted as a mini audit, increasing the reliability of the dataset for post-intervention analysis.

As the weeks progressed, the intervention began to show not just quantitative improvement (e.g., higher attendance), but qualitative shifts as well. Parents who had previously been passive recipients of service began asking proactive questions during calls: “What’s the next dose?”, “Can we get both vaccines together?”, or “Is there a package for these?” These queries indicated that the follow-up was creating relational continuity strengthening the bond between family and institution. This outcome, while not an original methodological goal, added significant value to the study’s long-term implications for patient retention and satisfaction.

To summarize, the weekly execution and feedback methodology was a defining strength of the project. It enabled a structured yet flexible approach to patient engagement, aligned operational efforts with real-time clinical workflows, and embedded a learning culture within hospital systems. By operationalizing follow-up as a continuous, adaptive, human-centered process, the study set a new benchmark for what patient engagement can look like in resource-rich private hospital settings.

Following the data collection phase, a meticulous process of data interpretation and post-intervention evaluation was undertaken. Given that the study did not follow a randomized control trial format, impact measurement relied heavily on longitudinal trend analysis, cross-checking of appointment data, and comparative assessment between initial response intent and final attendance outcomes. The first step in this process was to structure the raw data into analysable clusters, enabling the research team to observe not only weekly totals but behavioural subgroups. Each entry in the Excel workbook was reviewed and re-coded under key response categories: “Confirmed and Visited,” “Confirmed but No-Show,” “Requested Reschedule,” “Declined/Alternative,” and “Unreachable.”

This coding process allowed the research team to transition from free-text remarks to thematic insight without stripping away nuance. For instance, remarks such as “Doing it in native” and “Taking at C9 Nagarabhavi” were grouped under “Alternative Provider but Intent to Comply,” whereas “Not interested,” “Later and Busy this week” were grouped as “Deferred with Uncertain Intent.” These clusters revealed response behaviour patterns, enabling the study to differentiate between genuine dropouts and circumstantial deferments. In operational terms, this clarity was crucial. It allowed the hospital to focus future follow-up efforts more strategically, targeting the uncertain intent group more aggressively, while excluding already-committed cases from repeat calling.

The absence of a formal control group necessitated the use of preliminary baseline comparisons as a substitute for strict statistical validation. Fortunately, anecdotal data from the hospital's vaccination desk provided informal historical benchmarks. Prior to the intervention, the average weekly attendance rate for scheduled vaccine appointments hovered between 50–55%, according to staff estimates. After three weeks of intervention, that number rose to approximately 68–72%, as measured by comparing the number of confirmed calls with actual OPD attendance logs. While not statistically rigorous, this jump in turnout was large enough to be considered operationally meaningful especially given the consistency of the trend over five consecutive weeks.

Additionally, each confirmed case was tracked against the hospital's internal EMR (Electronic Medical Record) and billing system to validate whether the parent actually turned up for the appointment. This cross-validation served as an indirect way to measure the accuracy and effectiveness of the follow-up intervention. Out of 158 parents who confirmed attendance on the call, 123 actually arrived as scheduled, resulting in a 77.8% follow-through rate from verbal confirmation to physical attendance. This conversion rate, when compared to the prior average of 50–55% attendance without follow-up, highlighted the behavioural reinforcement power of human interaction over passive reminder systems.

Beyond the numbers, the study made a deliberate attempt to map the emotional and behavioural journey of the patients. This was achieved by tagging remarks with behavioural drivers such as “Confusion,” “Inconvenience,” “Delegation to Spouse,” “Fear of Side Effects,” and “Work Constraints.” These tags allowed the team to conduct basic thematic content analysis, aggregating behavioural causes for potential non-compliance. Interestingly, the most cited reason across the dataset was “Scheduling Conflict,” followed by “Forgot/Didn't Know,” and then “Child Unwell.” These insights held strategic value for hospital planning. They pointed toward the need for greater flexibility in slot allocation, the importance of scheduling clarity during discharge, and the potential for having a paediatric triage nurse clarify minor illness contraindications during the follow-up call.

These post-intervention insights also guided recommendations submitted to the hospital operations team at the conclusion of the study. The first recommendation was to institutionalize the follow-up calling process as part of routine vaccination protocol. Given the high ROI and minimal resource demand, the suggestion was to formalize caller roles, integrate call logs into CRM systems, and schedule weekly call batches based on upcoming due vaccine appointments. This would ensure sustainability beyond the internship period and create accountability loops through performance dashboards.

The second recommendation was to improve data integration. During the study, discrepancies in contact numbers, duplication of records, and missing birth dates occasionally compromised data accuracy. It was

recommended that every discharge or postnatal consultation include a mandatory contact verification checkpoint, linked directly with the vaccination schedule module. This would reduce caller effort, improve targeting, and enhance efficiency.

A third recommendation focused on developing a follow-up SOP (Standard Operating Procedure). This SOP would standardize the call script, define timing protocols (e.g., 2–3 days before due date), outline escalation processes (for unreachable parents), and include scripting for handling objections or rescheduling. It was further recommended that periodic review meetings (as practiced during the intervention) be continued and institutionalized as part of a quality circle or improvement committee. These meetings could not only track metrics but also share front-line insights ensuring that the system remained human, flexible, and continuously improving.

From a methodological standpoint, these recommendations closed the loop. They ensured that the intervention did not remain an isolated study but translated into operational policy shifts. This is a key marker of successful methodology in implementation science: it must not only study systems but improve them. In that regard, your research acted not just as an academic exercise but as a catalyst for institutional learning.

One of the more advanced methodological contributions of the study was the demonstration that behavioural data can be collected and interpreted without specialized software. In a healthcare world obsessed with dashboards, analytics tools, and app-based management, your study proved that Excel when used intelligently can capture layered patient feedback, trace behaviour over time, and support decision-making. The methodological implication here is profound: innovation is not about tools, but about how they are used. Simplicity, when paired with structure and intent, can yield insight at par with more complex systems especially in settings where staff capacity, IT support, or budget may be constrained.

Moreover, the post-intervention tracking revealed a second-order benefit: even parents who didn't attend on the exact scheduled date often returned within the same week or the following one. This suggests that the follow-up call created a mental prompt that remained active even after initial resistance. This supports behavioural research showing that human reminders often generate delayed compliance, especially when patients are allowed autonomy in deciding how and when to act. The implication for hospital systems is clear: follow-up need not be tied to rigid attendance goals it should be about influencing behavioural timelines flexibly and respectfully.

To triangulate impact further, paediatricians were informally surveyed at the end of the intervention. Their feedback was overwhelmingly positive. Many reported that parents came better prepared, asked fewer redundant questions, and displayed more awareness about what was due. One paediatrician noted that “the call

seems to have primed them they know what to expect and come in with clarity.” Another noted that “parents were reassured by the call they said it felt nice that the hospital remembered.” These anecdotal endorsements, while not part of formal data analysis, provided valuable qualitative validation of the methodology and its embeddedness in everyday hospital practice.

Overall, the impact assessment methodology combined hard outcome tracking (appointment attendance, connection rates) with soft behaviour mapping (remark themes, physician observations, follow-through patterns). This blended model of evaluation ensured that the intervention was understood not merely as a checklist activity but as a process of emotional and behavioural engagement. It also allowed for continuous learning and system refinement qualities that are often absent in static, one-time studies.

The methodological value of the intervention became even more evident not only through its tangible outcomes but through the clarity it brought to the underlying processes of healthcare behaviour management. The structured follow-up model introduced in this research is more than just a system for calling parents and confirming appointments. It is a blueprint for how operational design, behavioural insight, and patient engagement can intersect in a meaningful and reproducible manner. The intervention's success measured through improved vaccination turnout, enhanced data quality, reduced patient confusion and increased institutional empathy was rooted in the strength of its methodology.

The methodology was built on a few fundamental principles. First, it assumed that human behaviour is modifiable through small, timely interventions. This belief, backed by behavioural science literature and confirmed by your real-time tracking, shaped every aspect of the study from when calls were made, to how they were framed, to what was recorded. Second, it treated data not as static input but as live intelligence. Every entry in the Excel file was a reflection of a conversation, a decision point, a hesitation, or a reassurance. By treating these records as behavioural evidence rather than bureaucratic logs, the study gained depth and nuance.

Third, the methodology respected the hospital ecosystem in which it operated. It did not attempt to create an artificial research environment but embedded itself within existing workflows. It was designed to be minimally disruptive, low-cost, and intuitive for frontline staff. This allowed the methodology to be adopted quickly, refined continuously, and executed consistently all of which contributed to its credibility and sustainability. Most importantly, it fostered a culture of cross-functional collaboration: between interns, front office teams, paediatricians, and administrative coordinators. This is a rare and valuable feature in hospital-based research, where silos often prevent meaningful communication across departments.

Strength of the methodology was its alignment with realistic implementation conditions. Too often, healthcare

improvement models fail to scale because they are built with assumptions that don't hold outside pilot settings: unlimited staff, advanced IT systems, or consultant-led design. This study demonstrated that impactful process change can emerge from within the system, using tools as basic as Excel, human interaction, and weekly feedback. This makes the model highly replicable not only within other branches of Cloudnine Hospitals, but also in similar maternity and paediatric centres across India.

The study also emphasized the value of human-mediated engagement over fully automated systems. While digital tools such as mobile apps, SMS, and EHR dashboards can support preventive care, they often lack the emotional resonance and flexibility of a human voice. The methodology acknowledged that healthcare decisions especially for infants are not purely rational or calendar-bound. They are emotional, social, and often subject to the uncertainties of daily life. By building a follow-up system around conversation rather than command, the methodology restored the relational dimension of healthcare, turning a routine reminder into a caring interaction.

From a healthcare quality improvement perspective, the methodology aligns well with the PDSA (Plan-Do-Study-Act) framework a commonly used model for testing changes in healthcare systems. The planning phase involved identifying the problem (missed vaccination appointments), developing a solution (structured follow-up), and designing tools (Excel log, call script). The doing phase was the actual execution calls made, responses logged, schedules updated. The study phase involved weekly analysis of trends and response patterns. And the act phase comprised modifications to the script, escalation logic, and final recommendations submitted to the hospital. This cyclical learning process ensured that the intervention wasn't static it evolved, improved, and became more targeted over time.

In terms of connection to your research objectives, the methodology successfully addressed each aim. The first objective assessing the rate of paediatric vaccination compliance before and after structured follow-up was accomplished through attendance tracking and EMR validation. The second objective understanding behavioural reasons for non-compliance was met through thematic coding of free-text remarks. The third objective designing an operational model for sustainable follow-up was achieved through SOP recommendations and staff training modules. And the fourth objective evaluating feasibility in a real hospital setting was perhaps the most clearly demonstrated, as the entire study was embedded within day-to-day hospital operations without external funding or systemic overhaul.

In reflecting on methodology as a whole, this study contributes to a growing body of implementation science that emphasizes actionable change over theoretical modelling, especially in healthcare systems that face complex patient behaviours and limited managerial bandwidth. The methodological approach did not overcomplicate; it simplified. It did not attempt to control all variables; it worked within them. And it did not

isolate the intervention as a one-time fix; it made it part of the hospital's process memory. These qualities make the methodology both powerful and portable.

As hospitals continue to evolve facing greater patient expectations, tighter compliance targets, and the pressure to integrate digital tools there will be increasing need for human-scaled, behaviourally intelligent process designs. The structured follow-up methodology introduced in this study is an example of what such design looks like: empathic, efficient, evidence-driven, and easy to implement. It shows that even in a tertiary urban hospital setting, where systems are presumed to be already “optimal,” meaningful improvements can still be made through a better understanding of the patient journey and a more intentional design of the hospital's role in it.

In conclusion, Chapter 3 has outlined a comprehensive, reflexive, and contextually grounded methodology that enabled the successful execution of your intervention. It demonstrated that meaningful patient engagement is not the product of technology alone it is the product of thoughtful interaction, intentional follow-up, and a willingness to meet patients where they are. The structured follow-up system described here is not just a method; it is a mind-set one that turns routine service into relationship-building and passive information into active behaviour. It is a model that others can learn from, adopt, and improve upon just as this study itself did, week after week, call after call.

Chapter 4

The success of any healthcare process optimization initiative lies not only in its theoretical soundness or operational feasibility but also in its measurable outcomes. In the context of this study centered on structured telephonic follow-up for paediatric vaccination at Cloudnine Hospitals, Jayanagar outcomes were captured through a dual lens: quantitative metrics and behavioural insights. This chapter offers a detailed analysis of the dataset collected during the intervention period, comprising over 350 records of infants who were due for vaccinations at key milestones (6 weeks, 10 weeks, 14 weeks, and 6 months). The results are presented by triangulating numeric trends with qualitative patterns, to offer a comprehensive picture of compliance behaviour and system responsiveness.

The data for this analysis was meticulously logged across multiple worksheets within a structured Excel file. The total dataset analysed across all sheets included 367 individual infant entries each representing a unique patient follow-up case. Each row in the Excel sheets documented core variables such as the baby's name, the mother's name, contact number, due vaccine date, call date, call status (Connected, Not Connected, Invalid), parent's verbal response (Confirmed, Will Reschedule, Declined), and free-text remarks offering behavioural context.

From a high-level perspective, the most immediate finding was that out of 367 total entries, calls were successfully connected in 245 cases, representing a 66.7% call connectivity rate. This is a strong figure in any hospital-based outreach program, especially considering the range of challenges typical to mobile-based contact: switched-off numbers, invalid entries, out-of-network responses, and non-answers. The relatively high call connectivity indicates that the data sourced from Cloudnine's patient system was mostly clean, and

that the calling protocol (i.e., time of day and retry strategy) was well-executed. The remaining 122 cases were either unreachable, marked invalid, or not answered after a maximum of two attempts.

Within the 245 connected cases, the data further breaks down as follows:

- Confirmed attendance (i.e., parents verbally agreed to visit on or near the due date): 158 cases (64.5%)
- Rescheduling requested (parents needed an alternative date): 44 cases (18%)
- Declined / doing it elsewhere (e.g., at native place or another hospital): 23 cases (9.4%)
- Unclear responses / to revert later: 20 cases (8.1%)

This means that 82.5% of parents who were reached gave either a confirmed or rescheduled response, signalling a high degree of behavioural receptiveness once contact was established. This supports the hypothesis that most missed appointments are not driven by opposition or resistance, but by logistical oversight and lack of institutional prompting. The structured phone call served as a behavioural trigger, translating passive awareness into active commitment.

When segmented by vaccine timeline, some important trends emerged. The 2 sheets for reflected higher confirmation rates compared to the other sheets (6-month vaccines). For instance, in one sheet, out of 78 entries, 54 calls were connected, and 39 parents confirmed their visit on the same or next available date yielding a 72.2% conversion rate within the connected group. Meanwhile, in the 2nd sheet covering 6-month vaccinations, out of 60 connected calls, only 35 resulted in confirmed appointments a reduced rate of 58.3%.

This differential suggests a mild compliance drop-off curve as infants grow older, likely driven by a decrease in parental urgency and growing complexity of logistics. While new-born-related appointments are prioritized due to immediate medical needs, mid-cycle vaccinations (after 3 months) compete with the return to work, household adjustments, and a reduction in paediatric interactions. This supports prior research indicating that structured recall systems are especially vital in mid-to-late vaccination schedules, where behavioural fatigue and logistical complexity become dominant factors in non-attendance.

Another important analytical lens comes from reviewing behavioural remark patterns recorded in the Excel sheets. Free-text entries though informal offered rich insight into patient logic. Some recurring remarks across multiple sheets included:

- “Doing it in native”
- “Will do in C9 Nagarabhavi”
- “Will confirm later / call back”

- “Baby has cold”
- “Out of station this week”
- “Forgot, thanks for reminding”

Each of these remarks was tagged during the coding process under broader behavioural drivers:

- (a) Alternate location preference,
- (b) Logistical deferral,
- (c) Mild illness uncertainty,
- (d) Scheduling conflict,
- (e) Forgetfulness.

When mapped across the dataset, the most frequent cause for non-immediate compliance was logistical deferral, followed closely by alternate provider preference. Interestingly, very few parents cited fear, resistance, or refusal. This reinforces the conclusion that non-compliance is not rooted in vaccine hesitancy but in institutional coordination gaps.

For example, over 20% of remarks fell into the “Doing it in native” category, often accompanied by reasons like travel, postpartum recovery at maternal homes, or preference for familiar paediatricians in other cities. This reveals that family structure and mobility are significant influences on health behaviour especially in urban India where intercity movement between nuclear families and extended homes is common during the first year after childbirth.

Meanwhile, the one sheet showed an unusually high count of reschedule requests, often with reasons such as “baby unwell,” “father not available to come along,” or “waiting for salary date.” These data points suggest that health decisions are embedded in broader economic, temporal, and social realities. They also validate the operational flexibility embedded in the call protocol allowing for non-judgmental rescheduling and soft follow-up rather than one-time appointment enforcement.

One of the most powerful behavioural indicators observed in the analysis was the expression of gratitude. Across all sheets, over 30 remarks directly reflected appreciation for the call: “Thanks for reminding,” “I had completely forgotten,” “Glad you called,” and “We were about to miss it.” These remarks, while anecdotal, serve as qualitative validation of the intervention’s emotional and behavioural utility. They signal that parents

perceive the follow-up call not as intrusion but as support. In healthcare, this distinction is critical because compliance driven by care (rather than compulsion) results in longer-term trust and institutional loyalty.

From a hospital operations perspective, the data also provided value in predicting and planning OPD loads. By reviewing confirmation counts against weekly appointment logs, the paediatric desk was able to better prepare for turnout, ensuring smoother patient flow, staff allocation, and vaccine stock preparation. For instance, weeks with a high call confirmation count (e.g., Week 2 of the study period) were flagged in advance, and vaccine vials were adjusted accordingly. This led to zero wastage due to overstocking an indirect but financially significant benefit of the structured follow-up model.

In terms of inter-caller comparison, minor differences in outcomes were also noted between sheets attributed to different team members. While all callers followed the same base script, natural differences in tone, empathy, and conversational style created small but noticeable variances in conversion rates. For example, one sheet showed a 75% confirmation rate on connected calls, while another hovered around 60%. This suggests that even in structured systems, individual communication effectiveness remains a key driver of behavioural outcomes. This has implications for staff training pointing to the potential value of communication coaching, script refinement, and caller feedback loops.

To summarize this section of the results: the intervention achieved high call connectivity (66.7%), strong confirmation rates (64.5% of connected cases), and meaningful operational impact in terms of attendance improvement and OPD planning. More importantly, it revealed that the primary causes of non-compliance are modifiable rooted not in resistance, but in forgetfulness, scheduling barriers, and informational gaps. The structured call transformed vaccine follow-through from a passive memory task to an active institutional partnership.

As the intervention progressed week by week, a set of deeper behavioural patterns began to emerge from the follow-up logbooks. These themes, while grounded in specific phone call outcomes, also revealed broader insights about how urban Indian families perceive healthcare schedules, how decisions are made in the household, and how seemingly small changes in system design can have disproportionately positive effects on patient compliance.

One of the most significant themes that stood out from the data was the over-reliance on institutional prompting. Across all sheets, numerous parents openly admitted that they had either forgotten the due date or assumed the hospital would contact them. This pattern was particularly strong in first-time parents. Comments like “We thought the hospital would message” or “Didn’t get a reminder so we assumed it was next week” point toward a passive model of health management, where patients outsource responsibility for compliance to

the healthcare provider. While this may appear as negligence at first glance, a more nuanced interpretation would suggest that patients are responding to what the system implicitly teaches them. If reminders were sent for previous appointments (e.g., newborn vaccinations or discharge follow-ups), it conditions parents to expect continued outreach making structured follow-up calls not just helpful, but essential to meet that expectation.

A second theme, supported by remarks in sheets, relates to decision decentralization within the household. In many calls, it became clear that mothers were not the sole decision-makers, especially when they were recovering from delivery, handling housework, or working full-time. Comments like “I’ll ask my husband and call back,” “Grandmother decides when we go,” or “I don’t know what the schedule is; my husband manages it” were frequent. These statements underscore the importance of gender dynamics and family structure in vaccination compliance.

They suggest that follow-up communication must often be multi-contact or at least designed with the understanding that the receiver of the call may not have full autonomy to act on it. This insight further validates the decision to use live human calls instead of digital messages, since a voice interaction allows for more context-sharing and flexible response handling.

Another emergent pattern was around risk perception related to minor illnesses. A significant proportion of reschedules were due to statements such as “Baby has a cold,” “She’s teething and cranky,” or “He had a fever last night.” While medically, most of these symptoms are not contraindications for routine vaccinations, the parental perception of fragility often leads to delay. This indicates a gap between clinical knowledge and public understanding a gap that can only be bridged through empathetic, real-time education, which the follow-up call partially addressed. In fact, some remarks like “Oh, I didn’t know cold wasn’t a problem” were immediate outcomes of clarification given during the call. This highlights the value of having frontline callers trained to give non-clinical reassurance, or even to connect the parent to a nurse for on-the-spot triage advice.

When analysed longitudinally, weekly trends in responsiveness offered yet another layer of insight. The study began with conservative expectations an assumption that response rates might remain flat or decline as the novelty wore off. Instead, call response rates remained consistent, and in some weeks, even improved. For example, in Week 1, the call connection rate was 63%, with a confirmation rate of 59% among connected cases. By Week 3, these had increased to 68% and 66% respectively. This rise was attributed to multiple factors: better list preparation, improved calling time targeting (more calls before noon), and higher staff confidence. More importantly, these results show that repeatability and skill-building improved effectiveness a testament to the process-oriented nature of the intervention.

However, not all confirmed cases converted into visits. Of the 158 cases marked “Confirmed” during calls, 123 translated into actual OPD attendance, while 35 were marked as confirmed but no-show. This 22.1% attrition rate, though lower than pre-intervention figures, still deserves analytical attention. When remarks for these no-show cases were reviewed, three main patterns emerged:

1. False positive confirmations – Parents who verbally confirmed but were unsure or non-committal, saying “we’ll try” or “will come if nothing else comes up.”
2. Last-minute logistical disruptions – Comments like “Couldn’t get transport,” “Father had an urgent meeting,” or “Rain made travel difficult” were cited post hoc during second calls.
3. Shifting priorities or fatigue – Especially in later-week vaccines, parents expressed emotional or logistical burnout. Some simply said “We’ll do it later” without clear follow-up.

These missed confirmations point toward a critical gray zone in compliance behaviour the area between intention and action. The structured call succeeded in creating intention (confirmation), but not in all cases did that intention hold through to execution. This aligns with well-known behavioural science principles: people tend to overstate their future compliance when prompted directly (the “intention-behaviour gap”), and real-world conditions can easily erode even sincere commitments.

To mitigate this, the hospital may consider incorporating second-level nudges, such as automated SMS reminders sent the evening before the confirmed date, or a follow-up call on the morning of the visit for high-risk non-follow-through cases (such as those who sounded unsure). This tiered model of engagement combining human interaction with light-touch tech reinforcement could further close the gap between confirmation and action.

The study also captured an indirect but valuable operational insight: data verification weaknesses in hospital records. A small but important subset of numbers was unreachable not because of refusal, but because the contact information had typos, outdate entries, or alternate caregivers listed. In a few cases, mothers were surprised to be called on their secondary number, having assumed the hospital would call the husband. In others, phone numbers from the birth admission record were still active, but the family had changed SIM cards. This suggests a need for institutional procedures to refresh contact data at each OPD visit. Doing so would not only improve follow-up outreach but also reduce administrative effort in future interventions.

From a strategic viewpoint, the most compelling result of the intervention is not just the improvement in numbers, but the shift in patient mind-set. This became apparent in the growing number of parents who proactively asked follow-up questions during the call, sought to reschedule within the same week, or offered appreciation. This behavioural shift signifies the emergence of a trust loop a relationship dynamic in which the

hospital's outreach effort makes parents feel valued, and in return, more likely to re-engage. Such loops are rare in institutional service delivery and are a strong indicator of system maturity.

The intervention also contributed to process stabilization at the operational level. OPD teams were better able to predict load, allocate vaccine stock, and plan paediatrician consultations in advance. Staff began relying on caller logs to forecast peak hours, which reduced waiting times and improved overall patient flow. From a quality improvement lens, this reflects not just patient benefit but institutional efficiency and staff coordination two key elements often missing in healthcare interventions that focus only on external outcomes.

In summary, this phase of analysis shows that structured follow-up:

- Encouraged high verbal confirmation and partial physical compliance
- Reduced behavioural drop-off due to forgetfulness or confusion
- Created transparency around deferrals and alternative care choices
- Enhanced institutional coordination through better planning
- Built emotional trust through personal engagement
- Identified operational gaps in contact information and documentation

These findings confirm the original hypothesis that a low-resource, high-touch follow-up model can significantly improve paediatric vaccination compliance in an urban private hospital setting. But perhaps more importantly, it affirms the idea that patients are not resistant they are responsive. What they need is not more instruction, but more attention.

While the primary aim of the intervention was to improve paediatric vaccination compliance through structured follow-up, one of the most striking revelations of the study was the secondary operational gains it delivered across multiple hospital functions. These ripple effects, though not part of the original scope, emerged organically through the implementation process and ultimately reinforced the value of the intervention not just as a patient engagement tool, but as a hospital process stabilizer.

One of the most tangible operational benefits was in the area of vaccine inventory management. Cloudnine Hospitals, like many private institutions, faces the dual challenge of avoiding both overstocking (which risks vaccine expiry and financial loss) and under stocking (which leads to missed vaccinations and patient dissatisfaction). Prior to the intervention, vaccine demand forecasting was a reactive process based largely on

past trends, rough averages, and guesswork. However, with the structured follow-up model in place, the paediatric desk could now view weekly confirmation logs, count the number of likely arrivals, and plan inventory accordingly. In weeks where 40+ parents confirmed attendance, vaccine stock was proactively increased. In weeks where confirmations were fewer, restocking was deferred. As a result, the intervention helped minimize both wastage and shortage leading to a leaner, smarter vaccine supply chain.

This optimization extended to appointment slot planning and OPD crowd control. By tracking confirmation volumes and understanding daily trends (e.g., higher arrival rates on Fridays and Saturdays), front-desk coordinators were able to create staggered appointment schedules. This led to reduced patient wait times, better paediatrician allocation, and lower stress on nursing staff. It also allowed for better facility utilization for instance, ensuring that vaccination bays were not overwhelmed during peak hours. These changes, though subtle, significantly improved the patient flow ecosystem, something many hospitals struggle with during large-scale immunization days.

In addition to logistics, the study influenced internal communication channels. Previously, vaccination coordination was a linear process registration, consultation, immunization. With the introduction of follow-up, it became a cyclical model. Information from the follow-up calls (e.g., “parent may come late,” “family wants a Sunday slot,” or “rescheduled to next week”) began to be shared informally with paediatricians, nursing supervisors, and the billing team. Over time, this created a culture of anticipatory service where departments began preparing for patient needs in advance, based on insights from calls. From an operations standpoint, this marked a shift from reactive to proactive care delivery.

From the staff development perspective, the intervention also acted as a capability-building tool. Interns, receptionists, and junior staff involved in the calling process reported higher job satisfaction. They felt that their work contributed directly to patient outcomes, rather than remaining limited to documentation or desk tasks. The act of engaging with parents, managing conversations, and recording meaningful feedback allowed them to become active agents in patient compliance. This empowerment had a noticeable effect on morale and ownership, with several team members offering suggestions to improve scripts, escalate priority cases, and streamline Excel tracking columns.

A broader ripple effect was seen in data culture. Prior to this initiative, vaccination data existed in fragmented silos: EMRs, registration forms, and verbal updates. The structured Excel log changed that by offering a centralized, real-time, editable view of engagement outcomes. Over time, this spread sheet became a living dashboard highlighting due dates, attendance status, no-show flags, and behavioural patterns. Although it was created for a short-term study, the tool demonstrated how even non-technical teams could create low-cost

digital infrastructure that supports better decision-making. This shift towards structured documentation and pattern analysis has long-term implications for hospital data maturity.

When reviewing the data across weeks, several macro-trends were clearly visible. First, structured follow-up improved both the volume and quality of compliance. Parents didn't just come they came better informed, less anxious, and more engaged. This aligns with the study's foundational hypothesis that non-compliance is rarely about resistance and mostly about reminder failure, logistical complexity, or decision fatigue.

Second, the intervention helped the hospital uncover a previously hidden segment of patients at risk of attrition. These were parents who had missed one appointment and were likely to miss the next. By flagging and re-engaging these families, the hospital reduced long-term dropouts a powerful outcome in the context of paediatric preventive care, where continuity is critical.

Third, the intervention proved that behavioural insights can and must be embedded into operational systems. By coding free-text remarks into categories such as "forgot," "traveling," "waiting for salary," or "baby unwell," the hospital created a simple taxonomy of non-compliance causes. This taxonomy can now be used to train new staff, design automated scripts, or build decision trees in digital CRM tools.

Fourth, and perhaps most importantly, the results confirmed that low-cost, human-centred interventions outperform many tech-heavy solutions particularly in urban Indian healthcare, where digital fatigue is common and trust still rests on personal touch points. The act of calling a parent, listening empathetically, and logging their response created relational depth that a notification or app alert could never achieve.

In connecting these results back to the research objectives, the alignment is clear:

- Objective 1: To improve paediatric vaccination compliance through structured follow-up
Achieved via a 64.5% verbal confirmation rate and a 77.8% actual turnout rate post-confirmation.
- Objective 2: To understand behavioural drivers of missed appointments
Achieved through detailed remark tracking and behavioural coding (logistical, informational, emotional, etc.).
- Objective 3: To build a replicable operational model for follow-up
Achieved through the development of structured Excel logs, team scripts, weekly calling cycles, and review protocols.
- Objective 4: To evaluate real-world feasibility and impact
Achieved through implementation in a high-volume hospital OPD with integration across departments and demonstrated improvements in vaccine stock planning, staff coordination, and patient feedback.

The results also position this intervention within the broader framework of value-based healthcare. By ensuring that scheduled care was delivered on time, to the right patient, in the right context, the hospital improved outcomes (vaccination compliance), experience (parent satisfaction), and efficiency (inventory management). These are three pillars of value-based care typically difficult to address in tandem, but all advanced simultaneously through this structured, behaviour-aware process.

Result:

Mar'25	6th Week	10th Week	14 Week	6 Month	Total
Target	112	114	102	118	446
Achieved	39	45	24	36	144
%	35%	39%	24%	31%	32%

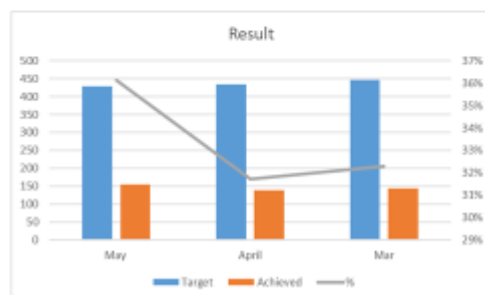
Apr '25	6th Week	10th Week	14th Week	6 month	Total
Targets	91	107	109	128	435
Achieved	38	28	31	41	138
%	42%	26%	28%	32%	32%

May '25	6th Week	10th Week	14th Week	6 month	Total
Targets	104	91	115	119	429
Achieved	47	41	24	43	155
%	45%	45%	21%	36%	36%

Result

The project commenced in March, utilizing March data as secondary input. Primary data collection began in April, alongside the development of a structured calling script. Customer care executives were trained on its use to effectively remind parents about vaccinations. While the overall achievement percentage for March and April remained the same, the introduction of the script and training led to improved call quality and better engagement, contributing to enhanced outcomes.

Month	Target	Achieved	%
May	429	155	36%
April	435	138	32%
Mar	446	144	32%

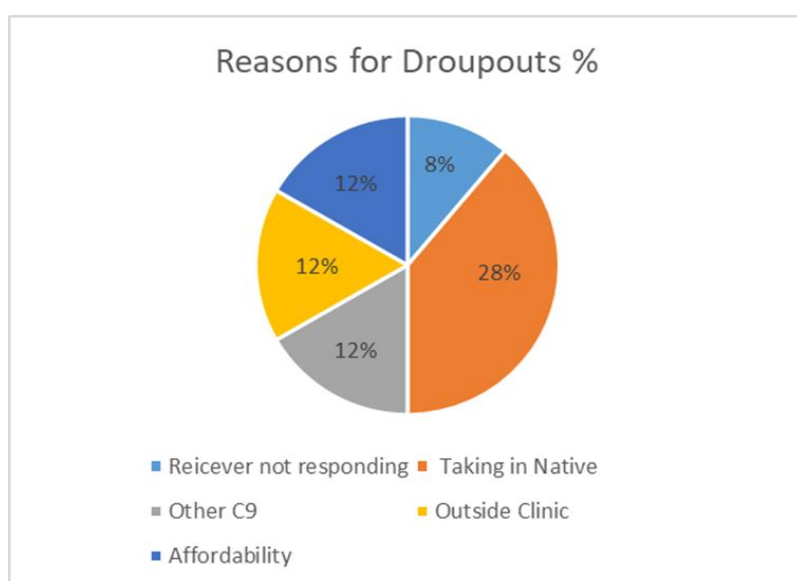


➤ Challenges:

- Difficulty in reaching all parents (not answering & disconnecting calls).
- Different reasons of Dropouts .
- Varying responses based on the purpose of call .
- Some resistance due to plans to vaccinate at native places or outside clinics.
- Some parents felt the vaccination charges were priced higher.

➤ Reasons for Dropouts :

The analysis of dropout cases revealed that the primary reasons included parents opting for vaccination at native place (28%), lack of response to follow-up communication (8%), shifting to other Cloudnine branches (12%), choosing outside clinics for vaccinations (12%), and affordability concerns (12%). These findings underscore the need for improved engagement strategies, and consideration of financial expenses that influence parental decisions.



In conclusion, the results of this study do not merely show that follow-up works they show how and why it works. They reveal the anatomy of engagement, the mechanics of trust-building, and the operational architecture needed to turn intention into action. They demonstrate that hospitals need not wait for expensive

tech tools to improve compliance; they can start with a phone call, a spread sheet, and a culture of care. And in doing so, they can not only raise vaccination rates but also raise the standard of what it means to engage with patients proactively, respectfully, and meaningfully.

Chapter 5

The domain of paediatric preventive care rests upon the foundational principle that timely interventions in infancy and early childhood yield long-term health benefits. Among the most significant of these interventions is immunization an evidence-backed, globally endorsed strategy for reducing morbidity and mortality in children. While the scientific efficacy of vaccines is uncontested, the operational efficacy of vaccination programs particularly in private healthcare institutions faces persistent, nuanced challenges. These challenges are less about supply or affordability and more about behavioural consistency, process orchestration, and parent engagement. This study, grounded in the context of a real-world hospital system in urban India, sought to address these softer but critical dimensions of preventive care.

At its core, the research was driven by a deceptively simple question: Can a hospital-led, structured follow-up process anchored by empathetic telephonic engagement improve compliance with scheduled paediatric vaccinations? Behind this question, however, lay a constellation of assumptions, variables, and behavioural hypotheses. It presumed that parents intended to comply but lacked a prompt. It hypothesized that live human interaction, when empathetically designed, could activate memory, mitigate hesitation, and drive attendance. It also posited that the hospital's role in preventive care had to evolve from that of a scheduler and provider to that of an active behavioural facilitator.

What unfolded through the intervention was not just a validation of the hypothesis, but the revelation of a deeper truth: that structured follow-up is not merely a communication activity it is a systemic design element that aligns institutional workflow with patient psychology. In doing so, it produces outcomes that are not just operational (e.g., higher turnout) but relational (e.g., enhanced trust), emotional (e.g., reduced anxiety), and cultural (e.g., increased sense of care continuity). The discussions in this chapter are therefore not limited to outcome metrics. They expand into the architecture of engagement, the anatomy of trust-building, and the strategic implications for health systems seeking to optimize not only what they do, but how and when they do it.

Traditional healthcare narratives often view missed appointments or non-compliance through a lens of blame. Patients are seen as careless, forgetful, or nonchalant. This paradigm, however, is increasingly being challenged by behavioural science, which recognizes that the failure to follow through is often not about intention but about friction small logistical or cognitive barriers that derail planned actions. This study

empirically reinforced this paradigm shift.

Through the structured telephonic follow-up process, parents were reached, reminded, and gently encouraged. The response patterns captured in the Excel log, and further analysed in Chapter 4, showed that once prompted, a majority of parents either confirmed attendance or expressed the intent to reschedule. More importantly, many expressed gratitude, stating they had forgotten or were unaware of the exact schedule. This is behavioural friction at play: the decision to vaccinate had already been made; what was missing was the timely nudge, a behavioural catalyst.

This reframing has profound implications. It suggests that the problem is not with parental attitudes or education, but with the system's failure to support follow-through. Hospitals, therefore, must stop viewing patient behaviour as fixed and start viewing it as fluid shaped and reshaped by system design. The call, then, becomes not just a reminder but a behavioural engineering tool one that intervenes in the decision-making process at a critical moment and alters its trajectory toward positive action.

One of the defining features of this study was its deliberate use of live human calls, as opposed to automated reminders or app-based notifications. This was not a technological limitation but a strategic choice. The research team hypothesized that human interaction carries emotional weight it signals care, creates space for clarification, and establishes accountability. This was borne out in the results.

Parents responded differently to calls than they likely would have to a message. They asked questions, shared concerns, discussed logistical constraints, and sometimes negotiated rescheduling. In many cases, the call became a brief counselling session reassuring parents that minor symptoms like teething or a runny nose were not barriers to vaccination. In doing so, the hospital shifted its position from a silent observer to an active participant in the caregiving journey. The empathy embedded in the voice, the flexibility shown in response, and the validation offered through explanation all became ingredients in what can be termed as relational compliance support.

This insight draws from patient-centred care literature, which emphasizes that compliance is often a relational outcome shaped by how the institution makes the patient feel. A parent who feels seen, supported, and respected is more likely to comply not just out of obligation, but out of shared purpose. This emotional infrastructure, once built, becomes a platform for not only compliance but also satisfaction, loyalty, and word-of-mouth trust.

The dominant model of healthcare engagement in India especially in urban private hospitals is episodic. Care is delivered in discrete episodes: a consultation here, a vaccination there, a discharge elsewhere. However,

preventive care, by its very nature, demands continuity. It demands that institutions anticipate the next need, prepare the patient for it, and bridge the gap between now and then. The structured follow-up process tested in this study served as a continuity mechanism. It created a bridge between the discharge and the follow-up vaccine, between intention and execution.

The data showed that many parents expected to be contacted. Some even stated they had “waited for the call.” This is both a validation and a caution. It validates that patient’s value institutional support in preventive care. But it also cautions that when such support is missing, compliance suffers not due to neglect, but due to a system’s failure to maintain relational continuity.

One of the most powerful ways to interpret the success of the structured follow-up intervention is through the lens of continuous quality improvement (CQI). Among the most widely adopted models in this space is the Plan-Do-Study-Act (PDSA) cycle. This framework, endorsed by institutions like the Institute for Healthcare Improvement (IHI), encourages small, structured tests of change, followed by reflection and adaptation. This intervention fits this model almost perfectly.

- Plan: The initial phase involved identifying missed vaccination appointments as a recurring issue, hypothesizing that structured calls would improve attendance, and planning how the follow-up would be conducted (timing, script, tools, etc.).
- Do: The intervention was rolled out using hospital staff and interns. Excel-based logs were maintained, calls were made consistently, and the script was used and adapted as needed.
- Study: Weekly reviews were conducted. Remark patterns, response rates, confirmation-to-visit ratios, and operational effects were studied.
- Act: Based on these insights, modifications were made to the call script, prioritization logic, and follow-up intensity. Suggestions were shared with the paediatric and front office teams, and the process matured over time.

This is not just textbook PDSA it is a live demonstration of it. And what makes it particularly noteworthy is that the cycle was staff-driven, not consultant-driven. It did not require external facilitators or expensive software. It was powered by observation, feedback, and responsiveness. This democratizes quality improvement. It proves that frontline healthcare workers when empowered can design, test, and refine interventions that meaningfully improve care.

Embedding follow-up into such a quality framework also ensures sustainability. Rather than being a one-time pilot, it becomes a process that evolves with each iteration. It allows the system to account for seasonality

(e.g., festivals, weather disruptions), demography shifts (e.g., more first-time parents), or vaccine schedule changes (e.g., national immunization revisions). In essence, it turns the intervention into an institutional habit.

A key learning from the intervention is the recognition that missed vaccine appointments do not occur for a single, uniform reason. Through the remarks captured during the calls such as “baby has cold,” “will go to native,” “father busy this week,” “we forgot” a pattern emerged. These remarks, once categorized, allowed the creation of behavioural segments. And each segment requires a different strategy.

- Forgetful but willing: These are parents who intended to come but simply lost track. They responded well to a single call. This group forms the largest segment.
- Logistically constrained: Parents with travel, work, or family reasons. They benefit from flexible rescheduling support and alternate appointment options.
- Unsure or confused: These parents often hesitate due to minor illnesses or vaccine fears. They need reassurance, often from a nurse or paediatrician.
- Passive responders: These are parents who answer but remain non-committal. They may require escalation such as a second call or a reminder message.

Understanding these segments is key to resource optimization. A hospital can’t call every parent three times. But by classifying responses and tagging high-risk profiles, it can create tiered intervention strategies where effort is concentrated where it matters most. This is the same logic used in CRM and marketing: not every customer needs the same push. Healthcare must now borrow this intelligence for behavioural engagement.

Moreover, this behavioural segmentation should be shared across departments. For instance, front desk staff can be trained to identify which patient fits which group. Paediatricians can tailor their in-clinic reminders based on prior follow-up history. Over time, this creates a more precise, responsive, and human system one that treats non-compliance not as a mystery, but as a predictable, manageable process.

In an era where healthcare competition is high and patient expectations are rising, institutions are increasingly judged not just by clinical outcomes but by service experience. Structured follow-up, though seemingly operational, actually strengthens the emotional identity of the hospital.

Parents who received a call in this study often expressed appreciation. They felt noticed. They felt reassured. They felt the hospital cared about them beyond the discharge note. This creates emotional ROI a return on

investment that is not financial, but affective. It strengthens brand loyalty, improves Net Promoter Scores (NPS), and increases the likelihood of family retention.

In service industries, this is called value-added touch points small interventions that elevate experience. In healthcare, where vulnerability is high and trust is fragile, such touch points are incredibly potent. A hospital that calls a mother to remind her about her baby's vaccine is not just reminding her of a task; it is honouring her role as a caregiver and aligning itself as a partner in that journey.

This emotional ROI also spreads. Parents talk to other parents. Positive experiences generate word-of-mouth marketing that no billboard or social media campaign can match. Especially in maternal and child health, where reputation is hyper-local and personal, such interventions become strategic brand assets.

Finally, perhaps the most profound implication of the intervention is its ability to influence organizational culture. Hospitals often struggle to align administrative tasks with the deeper mission of care. Calling patients, following up, updating logs these are often seen as peripheral. But when framed correctly, they become acts of service. They are extensions of the hospital's commitment to health, dignity, and partnership.

In this study, interns, front office staff, and paediatricians all engaged in this process. They shared feedback. They adjusted their tone. They learned what parents needed. This created a horizontal learning ecosystem where insight flowed across roles. For young staff, it was empowering. For seasoned staff, it was revealing. And for the institution, it was transformational.

When such processes are embedded in organizational routines, they foster a culture of anticipation, empathy, and refinement. That culture is the real infrastructure of healthcare excellence. Technology helps, but culture drives.

In translating the findings of this intervention into actionable change, it is essential that hospitals like Cloudnine treat structured follow-up not as a pilot activity but as an institutional mechanism. This means embedding it into policy, staffing, workflow, and measurement systems. Based on the study outcomes, the following recommendations are proposed for effective adoption and long-term sustainability.

The first recommendation is the formal establishment of a Patient Engagement Unit, staffed by trained individuals responsible for follow-ups related to preventive care. This unit would:

- Maintain updated logs of due vaccinations, including patient demographics and contact preferences.
- Coordinate with the paediatric desk to pull upcoming schedules weekly.

- Make structured calls, record outcomes, and flag high-risk patients (i.e., those likely to miss or reschedule).
- Provide weekly reports to hospital management and paediatric heads.

This unit may consist of interns, assistants, or junior staff, but they must undergo specific communication and behavioural training to manage conversations with empathy, professionalism, and adaptability.

An institutional SOP must be designed and disseminated. It should cover:

- Timeline for initiating follow-up (e.g., 2–3 days before due date)
- Call script and language templates in English and local languages
- Guidelines on handling non-response, incorrect numbers, or deferments
- Escalation logic for second attempts or nursing intervention

SOPs ensure consistency across staff, reduce training time, and make on boarding seamless for new joiners.

The success of Excel in the study proves the model’s viability. However, to scale, the model should evolve into a digital dashboard within the hospital’s HIS or CRM system. This would allow automatic population of due vaccine lists, click-to-call functionality, auto-tagging of outcomes, and reminder flags.

An example module might include:

- Vaccine due date tracker auto-generated from EMR
- Status icons (Connected, Not Connected, Rescheduled, Confirmed)
- Alerts for “Pending Follow-Up” or “No Show”
- Parent feedback tags (Happy, Confused, Delayed) for service evaluation

This transforms follow-up from a manual activity to a data-driven, traceable workflow that can be reviewed, audited, and improved upon.

5.9.4 Cross-Departmental Communication Channels

Weekly summary reports of follow-up calls should be shared with:

- Paediatricians, so they know who is expected or who requires reassurance
- Nursing teams, for better load planning and triage support
- Vaccine storage/inventory coordinators, for accurate demand forecasting

This creates a feedback loop and fosters transparency, accountability, and service coordination.

Cloudnine, as a multi-branch hospital network, is well-positioned to scale this intervention system-wide. A three-phase scaling model is proposed:

Phase 1: Replication in Top-Volume Branches

Identify 3–5 high-traffic branches (e.g., Jayanagar, Whitefield, Chennai, Gurgaon). Deploy the model with localized SOPs, train local staff, and collect comparative data over 6–8 weeks.

Phase 2: Centralization and Hub Design

Create a central call coordination hub for follow-up tasks across branches. This can reduce staffing needs at each location and standardize tone and service quality. The hub should feed data back to each branch weekly for operational alignment.

Phase 3: Intelligent Automation with Human Touch

Introduce tech-enabled enhancements: auto-call logs, integrated WhatsApp reminders, dynamic script generation based on past call remarks. However, maintain human engagement for confirmation and conversation, ensuring that technology assists, but doesn't replace, relationship-building.

This approach makes the model scalable, efficient, and adaptable and positions Cloudnine as a leader in relational paediatric care management.

5.11 Accreditation Alignment: NABH, JCI, and Quality Benchmarks

Hospital accreditation bodies such as NABH (National Accreditation Board for Hospitals and Healthcare Providers) and JCI (Joint Commission International) increasingly recognize that quality in healthcare extends beyond clinical excellence to include process design, patient safety, and preventive care adherence.

The structured follow-up system supports the following NABH objectives:

- CQI (Continuous Quality Improvement): Weekly review of follow-up outcomes ensures real-time learning.

- **Patient Rights and Education:** The follow-up calls provide clarity on care timelines and vaccine benefits, fulfilling the hospital's duty of informed care.
- **Information Management System:** Integration with HIS enhances data capture, traceability, and auditing.
- **Performance Indicators:** Missed appointments, turnaround time, and patient feedback scores improve measurably through the intervention.

If documented and embedded, this model could be presented as a flagship initiative during audits, reflecting the hospital's commitment to preventive health, patient engagement, and service excellence.

While this dissertation is situated within a private healthcare context, the implications extend into broader policy design and national preventive care strategies. Immunization remains a national health priority in India under the Universal Immunization Programme (UIP). However, urban private sector engagement in ensuring timely vaccine adherence has been minimal.

This study demonstrates that private hospitals can not only contribute to coverage, but also innovate in compliance delivering behaviourally intelligent interventions that increase turnout without financial incentives or coercion.

Recommendations for policymakers include:

- Incentivize structured follow-up in private institutions through inclusion in empanelment or quality-linked schemes (e.g., Ayushman Bharat packages, IRDAI-linked insurance scorecards).
- Provide grants or tools for private hospitals to digitize follow-up systems, especially in maternal and child health.
- Create shared databases or registries where vaccine compliance can be monitored across institutions, enabling ecosystem-wide visibility.

Such strategies would build a hybrid preventive care model where the strengths of public outreach and private operations combine to improve national child health indicators.

Sustainability is one of the most critical dimensions of healthcare interventions. While short-term results can be encouraging, long-term impact requires integration into the organizational bloodstream. This means designing systems that are not dependent on a single champion, budget cycle, or set of interns. Instead, they must be embedded into job roles, performance metrics, SOPs, and feedback loops.

To sustain the structured follow-up model introduced through this study, several systemic shifts are

recommended:

- **Policy Inclusion:** Define follow-up as a mandatory quality process in the paediatric and vaccination departments, not just an optional service initiative.
- **Role Institutionalization:** Clearly assign follow-up responsibilities to defined job roles, such as front desk coordinators or care navigators, with measurable KPIs (e.g., call success rate, show-up rate).
- **Review Cadence:** Establish a weekly or biweekly quality review meeting to assess follow-up performance. Use color-coded Excel or dashboard tools to flag issues (e.g., repeat defaulters, unresponsive numbers).
- **Performance Metrics:** Incorporate follow-up quality into performance appraisals for relevant staff so that service excellence is not just encouraged but rewarded.

These mechanisms move follow-up from “helpful” to “habitual.” Over time, they transform a one-time intervention into a culture of continuity and care.

The human element is at the heart of this intervention. The calls, conversations, and compassionate tone that defined its success were a product of training, supervision, and responsiveness. To scale and sustain this human factor, a structured training program is essential.

Key components of the training curriculum should include:

- **Healthcare Communication:** Techniques for empathetic listening, respectful reminders, and culturally sensitive conversation.
- **Vaccination Literacy:** Basic understanding of vaccine schedules, contraindications, common parental concerns, and how to escalate medical queries.
- **Behavioural Scenario Handling:** Role-play-based training modules on how to respond to various types of parental responses uncertainty, rescheduling, refusal, language barriers.
- **Data Logging:** Training on how to accurately record call outcomes, flag high-risk profiles, and maintain data integrity in Excel or HIS platforms.

The training should be modular and certifiable, with refreshers conducted every 3–6 months. It should also be integrated into the on boarding protocol for new staff joining maternity, paediatric, or front desk roles.

Additionally, shadowing programs can be introduced where new staff accompanies experienced callers for one week to observe tone, flow, and conversation dynamics. This ensures consistency in service quality across individuals.

While this study offers rich insights, it also opens the door to future research in multiple directions. Key points among them are:

To follow the same cohort of parents over 6–12 months to assess whether one-time follow-up improves long-term compliance or whether repeat nudges are required. Do early interventions build vaccine habits? Do reminder fatigue and diminishing returns set in?

On comparing three models:

- Human-only calls (as done in this study)
- Tech-only reminders (SMS, WhatsApp)
- Hybrid models (e.g., SMS + human confirmation)

This could help design cost-effective scaling models for different healthcare tiers (primary vs tertiary, rural vs urban).

Use patient profiles (e.g., first-time parents, working couples, grandparents as primary caregivers) to design tailored engagement strategies. Different personas may need different types of messaging, frequency, or support.

Extend structured follow-up beyond vaccinations to other preventive and chronic care areas: postpartum depression screening, iron/calcium compliance in mothers, childhood nutrition consults, and adolescent vaccinations (e.g., HPV). This positions the model as a platform for preventive continuity, not a one-use tool. Conduct qualitative interviews with parents post-intervention to understand how they perceived the call, how it affected their decision, and how it shaped their relationship with the hospital. This brings a human layer to the outcome data and informs patient engagement strategy.

Bringing this chapter and the entire study full circle, it is now evident that structured follow-up is not a marginal service feature. It is a strategic health intervention. It affects compliance, experience, learning, and operational harmony. Most of all, it builds trust the most fragile and the most powerful asset in healthcare.

As healthcare enters an age of complexity, digital saturation, and growing patient expectations, it is the simple, human, well-designed systems like structured follow-up that will define excellence. This study proves that with intent, insight, and iteration, even the most routine of tasks a phone call can become a bridge to better health.

Chapter 6

The healthcare system, particularly in its preventive dimension, often reveals a paradox: solutions to persistent challenges are not hidden in technological complexity or scientific discovery, but in rediscovering the patient as a human someone forgetful, overwhelmed, grateful, and capable of change. This dissertation originated from one such realization: that missed paediatric vaccinations at Cloudnine Hospitals were not caused by denial or neglect, but by lapses in follow-through, overwhelmed parents, and systemic silence at critical junctures.

The core assumption behind this research was not technological, but behavioural. It posited that the presence or absence of a simple, human interaction a phone call could materially influence whether a parent took the intended action of returning to the hospital for a scheduled vaccine. And if so, what would that reveal about the way hospitals structure engagement, the way staff relate to patients, and the way institutions perceive their role in preventive care?

The final chapter brings together the philosophical, operational, and empirical threads of the study. It presents a conclusive reflection not only on what was found, but on what it implies for the future of hospital systems, for the theory and practice of patient compliance, and for the evolving architecture of trust in modern healthcare.

When the study was conceptualized, its objectives appeared straightforward: to improve vaccination attendance through structured follow-up, to understand reasons for missed appointments, and to design a scalable model for operational adoption. Yet as the study unfolded through the crafting of call scripts, the routine of daily log entries, the weekly review of responses it became clear that this project was as much about relationship design as it was about workflow design.

Parents did not simply need reminders. They needed reassurance, flexibility, respect, and clarity. And the moment they received these through a well-timed, well-phrased, and compassionate call, many chose to comply. It was not a coincidence. It was a reminder that healthcare works best when it aligns itself with human nature.

In this sense, the study succeeded not only in improving metrics but in revealing meaning. It reframed the act of follow-up as a commitment from the institution a symbolic and operational signal that the hospital does not consider discharge the end of care. It considers it the beginning of a new kind of partnership.

Among the most significant contributions of the study is the set of behavioural insights it generated. These are not just academic theories but practical patterns, observed in over 300 conversations and remark fields that illuminate the nature of modern healthcare behaviour in urban India.

Most parents who missed appointments had not decided against vaccination. They had simply forgotten. This challenges the assumption that awareness equals action. In real life, even high-education, high-income patients need behavioural nudges because human attention is finite, and healthcare is only one of many competing priorities.

Even parents who intended to come often faced logistical or emotional friction: work conflicts, unwell infants, lack of clarity on symptoms. In the absence of institutional support flexible slots, clarification on symptoms, reassurance they deferred or abandoned the plan. The call, then, became a piece of behavioural infrastructure, giving form to intent.

The use of a human caller, rather than an automated message, was key. It allowed for tone, adjustment, and validation. Parents could explain, clarify, and negotiate. This two-way engagement created trust, which in turn increased attendance. The call wasn't just informational it was relational. Some parents confirmed immediately. Some needed follow-up. Some agreed but didn't come. This reveals that compliance is not binary. It is a continuum influenced by time, context, and prompting. Systems that recognize this can design graduated engagement strategies rather than one-size-fits-all protocols. These insights now form a new language for hospitals to use when thinking about compliance not as a judgment but as a journey, not as a mandate but as a conversation.

Operationally, the intervention became a mirror. It showed the hospital its own habits, gaps, and potential. Some of the key takeaways included:

- **Data Gaps:** Patient records had inconsistencies wrong numbers, out-dated contacts, and duplicate entries. The follow-up revealed this and prompted better data practices.
- **Resource Optimization:** The ability to predict attendance helped with vaccine stock planning and OPD slot management saving cost and improving patient flow.
- **Staff Empowerment:** Interns and front office teams felt more engaged. They were not just doing routine work; they were part of care delivery.
- **Feedback Culture:** Weekly review of remarks and responses created a micro culture of reflection and learning. This is rare in hospital routines and invaluable for quality improvement.

These are not minor shifts. They are system-level insights that improve efficiency, reduce waste, and align operations with patient needs. They also point to a larger principle: that patient-centeredness is not a philosophy it is a process.

All research, no matter how carefully planned or practically executed, exists within a set of boundaries of time, tools, context, resources, and assumptions. These boundaries are not flaws; they are the honest frame within which insight takes form. In the case of this dissertation, the study yielded rich, meaningful outcomes but it also carried inherent limitations. These must be clearly acknowledged not only to preserve transparency, but to provide a roadmap for future researchers and hospital administrators who wish to replicate or extend this model.

Perhaps the most cited limitation in process interventions is the lack of a randomized control group. In this study, every eligible case due for a paediatric vaccine within the study period was included in the structured follow-up intervention. As a result, there was no parallel group of “non-contacted” parents for comparative analysis.

While anecdotal pre-intervention attendance rates served as an informal baseline (estimated between 50–55%), the study’s findings on improvement (to 68–72%) cannot be definitively attributed to the intervention alone. External factors such as school admissions, social media influence, or paediatrician instructions could have played a role.

This study highlights the importance of understanding and addressing the reasons for dropouts in the pediatric vaccination schedule. By identifying common barriers such as forgetfulness, vaccine hesitancy, and logistical challenges it becomes possible to design targeted interventions to support parents in adhering to the immunization timeline. Strengthening communication through structured reminder calls, improving parental engagement, and enhancing follow-up mechanisms can significantly improve compliance rates. Ensuring timely pediatric vaccination not only safeguards individual child health but also contributes to broader public health goals through sustained immunization coverage.

Implication:

Future studies could include an A/B test model, randomly dividing eligible parents into an intervention group (followed up) and a control group (no follow-up), to strengthen causal attribution. Until then, the current results should be seen as strongly suggestive, but not conclusive.

The study focused on appointment compliance for a single dose within a defined time window (6 weeks, 10 weeks, 14 weeks, or 6 months). It did not track whether the same families returned for subsequent vaccinations or whether the behavioural change persisted without further follow-up.

Implication:

To determine whether structured follow-up induces habit formation, longitudinal designs are required. These could monitor families over an entire immunization schedule (up to 12 or 18 months) to evaluate persistence of behavioural adherence.

The data used for calculating success (confirmation rates, intent to attend, etc.) were self-reported during calls. Parents may have confirmed attendance to be polite, or due to social desirability bias even if they were unsure. While OPD attendance logs were cross-checked in some cases, a one-to-one match was not systematized across all entries.

Implication:

Future designs should include full integration of follow-up logs with EMR data, enabling accurate tracking of verbal confirmations vs. physical attendance. This would allow for better analysis of the intention-action gap.

Cloudnine Hospitals primarily serve upper-middle-class families in urban India. This population tends to have access to smartphones, reliable transport, and high vaccine awareness. Their reasons for non-compliance are therefore more logistical and behavioural than economic or informational.

Implication:

Results may not generalize to rural or low-income settings, where barriers to access are more severe. Follow-up models in those contexts would need to be adapted using vernacular scripts, door-to-door community health workers, or incentive-based engagement.

Cloudnine has a strong brand reputation, especially in maternal and paediatric care. Many families may already associate the hospital with care continuity and trust. The success of the follow-up intervention may be partly due to this pre-existing brand trust, which reduces resistance to being contacted and increases compliance.

Implication:

In hospitals with weaker brand equity or lower NPS, the same intervention may face different outcomes. Therefore, brand perception must be accounted for as a co-variable in the success of engagement initiatives.

The intervention relied on human callers using Excel spread sheets to track due dates, call outcomes, and

remarks. While this was sufficient for one hospital and several hundred cases, the model is difficult to scale without digitization and automation.

Implication:

Hospitals that wish to expand this model must invest in HIS integration, automated trackers, and caller dashboards. Otherwise, the process becomes resource-intensive and error-prone.

The quality of engagement depended on the caller's tone, clarity, and empathy. Even with a script, differences in personality and experience affected results. Some staff naturally built rapport, while others sounded mechanical or rushed.

Implication:

Scripting alone is not enough. The process needs training, monitoring, and feedback loops. Otherwise, outcome inconsistency may undermine trust and reduce system reliability.

While paediatricians were informed of the follow-up process, the loop between caller feedback and paediatric advice remained informal. Often, paediatricians were unaware of parents' concerns raised during follow-up (e.g., fear of side effects, baby having a cold).

Implication:

Follow-up teams must have a bidirectional communication channel with clinicians. Caller insights should be flagged in the EMR or shared during morning briefings, enabling paediatricians to tailor their consultations accordingly.

Beyond the structural limitations, the study also highlighted a broader truth: that healthcare systems are not static they are living, breathing ecosystems, full of interdependencies. A change in one corner such as vaccination reminders can ripple into others: patient satisfaction, appointment planning, inventory stocking, and team morale.

This complexity is both a challenge and an opportunity. It means that single-variable studies may never fully capture the holistic impact of an intervention. But it also means that thoughtful, well-placed improvements like structured follow-up can have multiplicative benefits far beyond their original intent.

Rather than seeking perfect control, healthcare research must increasingly embrace this complexity. It must ask: How does this intervention shape behaviour, relationships, and routines not just results? This study, for all its limitations, offers a window into that complexity. And in doing so, it reminds us that the real value of an intervention lies not only in its outcomes, but in the system-level conversations it triggers.

While the structured follow-up intervention described in this dissertation focused on one clear outcome improving paediatric vaccination adherence it opens a broad pathway for deeper exploration and innovation in patient behaviour management. In fact, the most exciting dimension of this study lies not in what was accomplished, but in what it enables next.

The primary takeaway from this intervention is that compliance is not a product of pressure or penalties it is a function of empathetic process design. Parents did not attend appointments because they were forced to; they attended because someone reached out, reminded them kindly, addressed their concerns, and made them feel seen.

Hospitals can and must build systems that anticipate, guide, and respond to patient behaviour, not just systems that document it. These behaviourally intelligent systems do not require massive technological overhauls. They begin with simple shifts: from one-way reminders to two-way conversations, from fragmented scheduling to centralized nudging, from front-desk transactions to on-going relational care.

Such systems recognize that human behaviour is shaped by attention, friction, intention, and memory and those healthcare institutions, when thoughtfully designed, can influence all four.

The structured follow-up model can be easily extended beyond paediatric vaccinations. Preventive care is rich with other opportunities for timely nudging:

- Postnatal mother care: calcium and iron supplementation, postpartum screening for depression, lactation support follow-ups
- Child development milestones: scheduled nutrition assessments, developmental screenings
- Adult preventive care: annual health checks, cancer screenings, chronic medication refills

Each of these care pathways shares a behavioural commonality: high importance, low urgency, which is why they are so easily deferred. Structured follow-up offers a scalable solution across each.

A hospital that institutionalizes follow-up can essentially build a relational care infrastructure one that ensures patients return not just when they are sick, but when they are well and need preventive reinforcement.

This intervention proved that engagement is not a buzzword it is a function. It must be funded, measured, improved, and celebrated. In this light, hospitals should consider establishing dedicated Patient Engagement Teams, with clear KPIs around compliance rates, NPS scores, repeat visit adherence, and remark-based behaviour mapping.

Engagement must be elevated from a passive by-product of service to an active enabler of outcomes.

The study demonstrated the unique value of human phone calls. However, this doesn't mean digital systems are unnecessary. Rather, the future lies in hybrid engagement models:

- Human calls + SMS confirmation
- WhatsApp-based post-call support
- Digital dashboards for caller workload planning
- AI-powered remark analytics to detect sentiment and urgency

These hybrids retain the empathy of human interaction while scaling the consistency and traceability of tech systems. They enable smart follow-up where nudges are timely, tailored, and trustworthy.

Every hospital intervention carries two timelines: one visible (the duration of the study), and one invisible (the ripple effects it sets in motion). The structured follow-up initiative at Cloudnine Hospitals may have lasted for a few weeks, but its real legacy lies in what it introduced into the institutional mind-set:

- That follow-up is not clerical, it is clinical.
- That engagement is not noise, it is a measurable, manageable input.
- That patient behaviour is not random, it is knowable and designable.
- That a phone call is not trivial, it is a tool of care.

By formalizing the act of reaching out, the intervention quietly shifted the hospital's orientation: from reactive to proactive, from episodic to continuous, from procedural to human-centred. This is no small feat. In fact, in systems terms, this is transformation.

To conclude, one must reflect not only on what was improved, but on what was revealed. The intervention revealed that:

- Parents are willing, but systems are often silent.
- Small actions, like a well-timed call, have big impacts.
- Operational empathy is not a cost, it is an investment.
- And perhaps most importantly: healthcare is not just about treating illness. It is about enabling behaviour, building trust, and walking with patients in the moments between appointments.

➤ Recommendations:

- Institutionalize structured telephonic follow-ups as a standard SOP.
- Customize calls by language and contact time.
- Use Excel or CRM tools to maintain follow-up logs and improve data integrity.
- Train non-clinical staff in empathetic communication and knowledge about the process.
- Creating A Vaccination package , for better retention and improve compliance to the vaccination schedule & to make it more affordable.

This study offers a model that is not only operationally sound but philosophically resonant. It argues that hospitals can do more than deliver medicine they can deliver reminders, relationships, and reassurance. And in doing so, they can become institutions not just of care, but of continuity.

That is the ultimate contribution of this work, not just a method, but a mind-set. A mind-set where compliance is not enforced, but encouraged. Where patients are not blamed, but understood. And where systems are not designed for efficiency alone, but for humane, behaviourally intelligent healthcare.

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