

Supply-Demand Mismatch in Integrated Medical-Elderly Care Services: A Dual-Survey Study from Liuzhou, Western China

Qiuli Liang^{1*}, Jiahe Wei², Liyun Qiu^{3#}

¹Guangxi Liuzhou Xianyuan Health Industry Co., Ltd., Liuzhou, China

²Department of Otorhinolaryngology, Laibin People's Hospital, Laibin, China

³Liuzhou Social Welfare Institute, Liuzhou, China

Email: *15507767427@163.com

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Abstract

To assess the current implementation status of integrated medical and nursing care services in Liuzhou, identify key barriers, and explore optimization strategies. From July to September 2025, a convenience sampling method was used to conduct a questionnaire survey among 3160 elderly residents in elderly care institutions in Liuzhou, collecting data on sociodemographic characteristics, health status, service needs, and awareness of integrated medical and nursing care. Concurrently, a supplementary survey was administered to 216 in-service nursing aides to examine workforce composition, salary satisfaction, and vocational training status. Among the elderly sample, 73.9% were aged 80 years or above, 71.8% had three or more chronic conditions, and 77.4% had varying degrees of disability. The most prevalent service needs were daily living assistance (37.3%) and basic nursing care (31.6%). The awareness rate of integrated medical and nursing care was 63.0%. The nursing aide survey revealed that 68.5% were aged 40 or above, 35.2% had education at or below junior high school level, over 70% had a monthly income below \$446.4, only 34.7% were satisfied with their salary, and 51.4% had not received tiered training. The findings suggest a potential structural misalignment between resident care needs and workforce capacity. This interpretation is supported by the conjunction of high care demand among residents (77.4% with functional dependence) and constraints on the supply side (aging workforce, low salary satisfaction, and limited tiered training among nursing aides). However, direct measures of service capacity, staffing ratios, or service availability were not collected in this study. These findings point to several areas requiring policy attention, including resource distribution, service quality standards, and care-

*First author.

#Corresponding author.

giving workforce development. Recommendations include establishing a tiered collaborative service network, introducing smart elderly-care technologies, and developing a remuneration incentive system linked to stratified training to systematically enhance regional service capacity.

Keywords

Integrated Medical and Nursing Care, Aged Care, Long-Term Care, Chronic Disease Management, Liuzhou

1. Introduction

According to the main data bulletin of the 2025 National 1% Population Sample Survey, China's population aging process continues to accelerate. By the end of 2025, the national population aged 60 and above had exceeded 320 million, accounting for over 22.0% of the total population, firmly placing the country in a moderately aging society [1]. More than 78% of older adults suffer from at least one chronic disease, and the absolute size of the disabled and semi-disabled elderly population is steadily increasing [2]. This profound demographic shift places enormous pressure on the traditionally separate medical and elderly care service systems, and the overlapping demand for both medical and nursing resources among older adults has become increasingly essential [3]. Against this backdrop, integrated medical and nursing care—as an institutional innovation and service model designed to break down sectoral barriers and integrate care resources—has been established as one of the core national strategies for optimizing the supply of elderly health services [4].

Existing domestic literature predominantly focuses on macro-level policy analysis, experience reports from first-tier cities, or static descriptions of service supply and demand within specific regions, while empirical investigations targeting medium-sized industrial cities in western minority areas remain relatively scarce. Notably, few studies have delved into the practical tensions faced by mid-to-high-end medical-nursing institutions operated by private capital, nor have they fully elucidated the structural contradiction of high ability to pay—high care demand—service supply mismatch within the specific urban context [5]. Taking Liuzhou as an example, as an important industrial hub in Guangxi with a relatively high urbanization level and a comparatively stronger economic capacity among its elderly population, the city still exhibits numerous unresolved issues regarding the accessibility, equalization, and quality assurance of integrated medical and nursing services [6]. Furthermore, most studies have adopted a single perspective from the service users (older adults), rarely extending analytical attention to the frontline service providers—namely, nursing aides—and thus failing to fully reveal the endogenous mechanisms of the caregiving human capital predicament [7].

Among the pilot cities designated for home-and community-based elderly care service reform during China's 14th Five-Year Plan period, Liuzhou has been ex-

perimenting with medical-nursing integration—something of demonstrative value for the western region. The present study, based on questionnaire surveys of elderly persons served by Liuzhou's care institutions, sets out the facts about service usage and the prevailing patterns of demand. Complemented by a focused survey of nursing aides, it proposes to treat the demand side and supply side as two dimensions, thereby enabling an exhaustive analysis of barriers to workforce development, and aims to meet the need for empirical data on integrated care in medium-sized urban areas—both in theory and in practice—as well as for the Healthy China initiative.

2. Subjects and Methods

2.1. Survey Participants

Inclusion criteria for elderly participants entailed: aged 55 years or above and continuously residing in an elderly care institution in Liuzhou; having resided in Liuzhou for at least 6 consecutive months; possessing basic cognitive and communication abilities to complete the questionnaire. It should be noted that only 100 participants (3.1%) were in the 55 - 59 age group; therefore, subsequent analyses and discussions primarily focus on those aged 60 and above.

Inclusion criteria for nursing aides involved: currently employed as nursing staff in elderly care services during the survey period; and providing informed consent and voluntary cooperation. A total of 216 valid questionnaires were collected.

The elderly survey was mostly conducted at Liugang Xianyuan Elderly Care Center—a major privately operated, mid-to-high-end, integrated facility for medical and elderly care located in Liuzhou—with some help from a few other private elderly care institutions in the city. A total of 3160 individuals were selected by means of convenience sampling (*i.e.*, without prior statistical planning), with most of them coming from Liugang Xianyuan and fewer from the other centers. The sample size is not based on a calculation of statistical power; it is simply the count of those who met the eligibility criteria and volunteered to be surveyed (July-September 2025). That is to say, all qualifying residents at the various participating institutions were invited, and the 3160 cases represent the full census of such people at these sites during the study interval.

A survey of nursing aides was conducted with the aid of the Wenjuanxing online platform. Invitations to take part were issued—through both formal and informal means—by the training and continuing education bodies of the Liuzhou elderly care community and by relevant associations. The 216-person sample was drawn from many cities of Guangxi Zhuang Autonomous Region, which is geographically more varied than the elderly survey area. The number of cases (216) is not based on a predetermined statistical aim but rather on the actual voluntary participation of respondents during the investigation period.

2.2. Survey Methods

For the elderly group, a structured questionnaire was developed based on litera-

ture review and expert consultation, covering sociodemographic characteristics, economic status, types of chronic diseases, activities of daily living (ADL), service preference, and awareness of integrated medical and nursing care policies. The survey was administered through face-to-face interviews combined with self-administration. A total of 3160 questionnaires were distributed, all of which were returned and valid, yielding a 100% response rate.

For the nursing aide group, an electronic questionnaire was administered via the Wenjuanxing online platform, covering basic personal information, employment type, monthly income, salary satisfaction, cumulative training duration, receipt of tiered training, and future training willingness. A total of 216 valid electronic responses were collected, with a 100% validity rate.

2.3. Statistical Analysis

Descriptive statistical methods were employed for data analysis. Categorical variables were presented as frequencies (n) and percentages (%). Data processing and calculations were performed using Excel 2021 and SPSS 26.0 software.

3. Results

3.1. Elderly Survey Results

3.1.1. Sociodemographic Characteristics (Table 1)

Table 1. Sociodemographic characteristics of the elderly participants (N = 3160).

Variable	Category	n	(%)
Gender	Male	1260	39.9
	Female	1900	60.1
Household registration	Rural	630	19.9
	Urban	2530	80.1
Age group (years)	<60	100	3.1
	60 - 70	240	7.5
	71 - 80	490	15.6
	80 - 90	1680	53.3
	>90	650	20.6
Marital status	Married/cohabiting	880	27.8
	Never married/divorced/widowed	2280	72.2
Education level	Primary school or below	630	19.9
	Junior high school	1210	38.3
	Senior high/technical secondary	970	30.7
	College/university or above	350	11.1
Monthly household income (\$)	≤297.6	0	0
	287.75 - 446.4	480	15.2
	446.55 - 595.2	100	3.2
	>595.3	2580	81.6

3.1.2. Health Status and Service Demand Profile

Among the respondents, 71.8% (2260) had three or more chronic conditions simultaneously, and 88.9% (2810) rated their self-perceived health as “fair” or “very poor.” Regarding activities of daily living, 49.5% (1560) had partial functional limitations, and 27.9% (890) were completely dependent on others for care, together indicating that over three-quarters of the institutionalized elderly were disabled or semi-disabled. In terms of service demand, daily living assistance (37.3%) and basic nursing care (31.6%) ranked highest, while disease treatment accounted for only 12.5%. Detailed health and demand data are shown in **Table 2**.

Table 2. Health status and service needs of elderly participants (N = 3160).

Variable	Category	n	%
Number of chronic conditions	1	100	3.1
	2	390	12.2
	3	410	12.9
	>3	2260	71.8
Self-care ability	Fully independent	710	22.5
	Partially dependent	1560	49.5
	Completely dependent	890	28.2
Most desired service	Disease treatment	390	12.5
	Rehabilitation therapy	350	11.2
	Preventive care	150	4.7
	Daily living assistance	1180	37.3
	Nursing care	1000	31.6

3.1.3. Awareness of Integrated Medical and Nursing Care

(560) out of 63.0% (1990) of those surveyed, awareness of the combined medical-nursing care model was indicated, while 17.7% (560) admitted to having heard of it but knowing little about it, and 19.3% (610) had no idea at all. As for sources of routine care, 83.2% (2630) generally relied upon self-management or institutional unified arrangements, with just 5.8% (183) getting individual one-to-one help.

3.2. Nursing Aide Survey Results

3.2.1. Demographic Characteristics and Workforce Structure

Among the 216 nursing aides, 202 (93.5%) were female. The age distribution showed a mid-to-older age profile: the largest group was aged 40 - <50 years (98, 45.4%), followed by those aged ≥ 50 years (50, 23.1%), while only 18 (8.3%) were aged 20 - <30 years. Regarding education, 76 (35.2%) had education at or below junior high school, and 67 (31.0%) had technical secondary/senior high school education, together accounting for over two-thirds of the workforce. The majority were contract employees (163, 75.5%). See **Table 3**.

Table 3. Basic characteristics of nursing aides (N = 216).

Variable	Category	n	%
Gender	Female	202	93.5
	Male	14	6.5
Age group (years)	20 - <30	18	8.3
	30 - <40	50	23.1
	40 - <50	98	45.4
	≥50	50	23.1
Education level	Junior high school or below	76	35.2
	Technical secondary/senior high	67	31
	College	45	20.8
	Bachelor or above	28	13
Employment type	Permanent staff	45	20.8
	Contract employee	163	75.5
	Temporary worker	8	3.7

3.2.2. Salary Level and Job Satisfaction

The largest group (103, 47.7%) had a monthly income of \$446.4 - 595.2 followed by 66 (30.6%) with \$297.6 - 446.4, and 17 (7.9%) with less than \$297.6. Overall, over 70% had monthly incomes at or below \$446.4. Regarding salary satisfaction, only 75 (34.7%) expressed satisfaction or high satisfaction, 91 (42.1%) rated it as “fair,” and 50 (23.1%) indicated dissatisfaction or high dissatisfaction. See **Table 4**.

Table 4. Salary and satisfaction of nursing aides (N = 216).

Variable	Category	n	%
Monthly income (\$)	<297.6	17	7.9
	297.6 - 446.4	66	30.6
	446.4 - 595.2	103	47.7
	>595.2 yuan	30	13.9
Salary satisfaction	Satisfied or above	75	34.7
	Fair	91	42.1
	Dissatisfied or below	50	23.1

3.2.3. Current Status of In-Service Training and Development Needs

Regarding training duration, 115 (53.2%) had received more than one year of cumulative training, 40 (18.5%) had less than one month, and 4 (1.9%) had never participated in any training. Regarding the implementation of tiered training, 111 (51.4%) reported that their institutions did not conduct training stratified by professional title, education, or length of service. In terms of desired training frequency, over 70% wished for at least quarterly sessions (34.7% monthly, 36.6% quarterly), See **Table 5**.

Table 5. Training status and needs of nursing aides (N = 216).

Variable	Category	n	%
Cumulative training duration	>1 year	115	53.2
	3 months - 1 year	23	10.6
	1 - 3 months	30	13.9
	<1 month	40	18.5
	Never attended	4	1.9
	Not reported	4	1.9
Tiered training offered	Yes	105	48.6
	No	111	51.4
Desired training frequency	Monthly	75	34.7
	Quarterly	79	36.6
	Annually	33	15.3
	Other	29	13.4

4. Discussion

4.1. Comparison with Similar Domestic Surveys

The prevalence of multimorbidity (≥ 3 chronic conditions) among the elderly in this survey (71.8%) was significantly higher than that reported in some other regions of China (example, approximately 40% in Jiangxi and approximately 40% in Shihezi, Xinjiang) [8] [9]. The root cause of this discrepancy likely lies not in the overall poorer health status of Liuzhou's elderly population, but in the fact that the study sample was concentrated in mid-to-high-end for-profit medical-nursing institutions. Residents of such facilities not only require relatively high out-of-pocket payment capacity but also often choose institutional care precisely because of their heavy disease burden and urgent care needs, thus introducing a strong selection bias in health variables. This finding suggests that when making horizontal comparisons of prevalence data across studies, it is essential to carefully examine the institutional type and admission criteria of the sample.

At this point, the 63.0% awareness level of integrated medical and nursing care in the present survey is much higher than that recorded in a similar study [10]. Such an encouraging figure seems likely to be associated with Liuzhou's designation as a national pilot city—its role in pushing for policy change and for project development—as well as with the institution's consistent effort to build a market and to publicize its services. Nevertheless, there are many factors—among them affordability, accessibility, and confidence in service quality—that might temper the conversion of awareness into actual usage, a matter calling for further (longitudinal) examination [11].

4.2. Four Typical Models in Local Practice and Their Inherent Tensions

Based on a review of existing practices in Liuzhou, four representative pathways

for integrated medical and nursing care can be identified: contracted collaboration between large medical institutions and elderly care facilities; on-site infirmaries or nursing stations within large elderly care institutions; geriatric departments or long-term care wards in general hospitals; and family doctor contracted services centered on community health service centers.

A representative example of Model 1 is Liuzhou Xianyuan Health Industry Co., Ltd., which leverages the specialized medical strength of Liugang Hospital to build a one-stop service chain covering acute care, rehabilitation, daily living assistance, cultural recreation, and health-oriented tourism. It has been rated as a national five-star elderly care institution by the Guangxi Department of Civil Affairs [2], with an occupancy rate consistently above 78% according to institutional records (Liugang Xianyuan internal statistics, unpublished). Its core clientele are high-income elderly (those with monthly income > \$595.2 accounting for 81.6% in the sample). While this premium model delivers high-quality services, it also entails high operational costs and market pricing, making it difficult to replicate on a large scale for average-income groups without external subsidies. The on-site medical department model (e.g., in public welfare homes), though more affordable, commonly faces challenges such as incomplete drug formularies and limited emergency response capacity (especially during nights and holidays) based on field observations and staff interviews. The development of geriatric departments in general hospitals is constrained by the diagnosis-related group (DRG) payment reform: elderly patients typically have prolonged hospital stays, multiple complications, and high treatment costs, making them performance bottlenecks under current evaluation systems, as commonly reported in the Chinese health care literature [7]. Family doctor contracted services, despite strong policy support, often suffer from “signed but not served” and perfunctory service delivery, rooted in insufficient primary care general practitioners and a lack of effective performance incentives to support high-quality proactive care.

4.3. Structural Supply-Demand Mismatch: From Macro Data to Micro Experiences

Survey results—taken together with known macro-level data on service provision—seem to reveal a possible structural misalignment between stated care needs and the current service infrastructure. By 2023’s end, Liuzhou had 803,200 registered individuals aged 60 or older, amounting to 20.1% of its full population [1]. This yields approximately 10.9 beds per 1000 elderly persons—a figure still well short of the city’s “14th Five-Year Plan” target of 26,000 beds (to be achieved by 2025) [3]. Yet it is important to recall that the present analysis does not deal explicitly with staffing levels or with actual service delivery. The “mismatch” interpretation is thus inferential, based on the coincidence of very high resident-reported care needs with nurse-aide-related workforce limitations.

However, resource scarcity is not the whole issue; more noteworthy is the structural mismatch between supply and demand. On one hand, 77.4% of the elderly

in this survey had reduced daily living abilities, and 71.8% had multimorbidity, indicating a high dependence on continuous medical support and professional care. On the other hand, their top two service demands were daily living assistance and nursing care, rather than disease treatment. This ranking difference reveals a subtle signal: for long-term institutionalized, very old adults, daily comfort, safety, and dignity may be more meaningful on a routine basis than acute medical interventions. This requires that the design of integrated medical and nursing care services should not simply transplant medical care into nursing homes, but should place chronic disease management, functional maintenance, risk prevention, and comfort care at a more fundamental position.

In addition, it is true that 81.6% of those surveyed had monthly incomes above \$595.2—which superficially suggests an ability to meet payment demands—but this group is composed only of residents of certain high-end market-oriented institutions and has no bearing on the financial situation of the wider community-dwelling or rural elderly. Even when one assumes high capacity to pay, there persists—long-term—difficulty in estimating price sensitivity, value for money, or consistent willingness to pay for care.

4.4. The Caregiving Human Capital Predicament: Structural Evidence from the Frontline Nursing Aide Survey

The supplementary survey of 216 nursing aides reveals a structural profile of the industry's talent shortages. The workforce exhibits pronounced aging and low educational attainment: nearly 70% are aged 40 or above, over one-third have education at or below junior high school level, less than 10% are aged 20 - 30, and only 13% hold a bachelor's degree or above, indicating a severe lack of attractiveness to younger laborers and highly educated talent. The incentive effect of salary is weak, with over 70% earning less than \$446.4 per month and only 34.7% satisfied with their compensation. When work intensity, occupational risks, and remuneration are chronically imbalanced, staff turnover becomes inevitable. Training system development is clearly lagging: more than half of nursing aides have not received tiered training, while over 70% desire at least quarterly learning opportunities, with the most urgent skill needs concentrated on common disease care and first aid knowledge, reflecting a significant disconnect between training content and actual workplace competency gaps.

These phenomena are not unique to Liuzhou; similar patterns have been observed in comparable surveys in other regions [12] [13]. Underlying this is a vicious cycle [14]-[16]: at the social cognition level, elderly care work is persistently equated with menial physical labor, enjoys low occupational prestige, and combined with enclosed work environments, high risks of falls and pressure injuries, and heavy emotional labor, collectively creates a “hard to recruit, hard to retain” predicament. At the institutional operation level, due to the industry's generally slim profit margins, managers tend to be conservative in human resource investment, preferring to maintain a low-pay, high-turnover status quo rather than pro-

actively increasing training expenditures or raising salary benchmarks. This forms a closed loop: low salary low satisfaction high turnover fluctuating service quality occupancy rate affected operational revenue reduced further suppression of labor costs. In market-oriented for-profit institutions, this cycle is particularly rigid due to the absence of fiscal underpinning, necessitating external policy interventions to break the deadlock.

4.5. Study Limitations and Future Directions

Regarding sample representativeness, the study selected only relatively large elderly care institutions, resulting in a sample heavily concentrated on urban-registered, middle-to-high-income, very old adults with strong care needs. Generalization of the conclusions to other care settings in Liuzhou—such as rural nursing homes and community day-care centers—should be made with caution. The nursing aide data also did not cover public-sector institutions or community-level caregivers, limiting the universality of the findings. Future research should strive to establish multi-center sample repositories covering public, private, and public-private partnership institutions, and incorporate community- and home-based care service providers and elderly recipients to obtain more externally valid comparative analyses. Subsequent survey instruments could further include validated satisfaction scales, willingness-to-pay items, and burnout assessment modules to more precisely characterize the interactive mechanisms and psychological variables between supply and demand sides.

5. Conclusions and Policy Recommendations

5.1. Hierarchical and Differentiated Development of the Integrated Service System

Local governments are advised to lead the development of a graded referral system—covering tertiary hospital emergency care, secondary hospital/large institutional rehabilitation care, community-based health care (or nursing homes) for daily needs, as well as long-term home visits for the elderly—and to plan accordingly for each tier. Clinically stable elderly persons who have completed full hospital treatment might now be referred downward along green channels to combined medical-nursing institutions or to community caregivers, thus helping tertiary hospitals to release beds more quickly and to make better use of their own resources. To meet the varying needs of elderly people with regard to income, a mixed payment model—combining government-provided core services with individually bought supplementary ones—might be tested, along with care vouchers aimed at low-income disabled persons to promote access to general services.

5.2. Reform of Physician Multi-Site Practice and Career Development Pathways for Nursing Aides

Health authorities are advised to appropriately relax administrative constraints on multi-site practice by attending physicians and above from tertiary hospitals at

elderly care institutions, with additional remuneration shared between institutions and government to fill the structural shortage of physicians at primary-level integrated facilities. Concurrently, a competency-based career ladder and professional title promotion system for nursing aides in the integrated care sector should be established as soon as possible, linking advancement to salary and social security. Only when care work is perceived as a formal profession with professional thresholds and promotion prospects—rather than mere manual labor—can the industry's overall attractiveness be fundamentally reversed.

5.3. Optimizing Medical Insurance Payment Leverage and Primary Care Performance Evaluation

Given the DRG payment challenges faced by geriatric departments in general hospitals, it is recommended that insurance administrators establish independent evaluation units for elderly health services, relaxing the strict turnover rate and average length-of-stay targets for geriatric departments and instead incorporating quality indicators such as functional recovery outcomes and pressure ulcer incidence control. At the community health service level, performance appraisals should shift towards service volume, health improvement among residents, and satisfaction of contracted clients, leaving room for fee-for-service differentiated home visits and personalized health management, thereby incentivizing primary care staff to deliver and value their work.

5.4. Integrating Smart Elderly Care Technologies into Routine Care Scenarios

(IoT) aging Internet of Things (IoT) sensing systems, wearable monitoring units, and AI-based early warning tools may be used to launch intelligent applications—remote observation of vital signs, automatic fall alerts, or tracking of long-term conditions—as needed. These measures help to reduce, at least partially, the burdens arising from a shortage of human staff and encourage early diagnosis, with less reliance on reactive treatment. Government agencies might now consider digital special subsidies for joint medical/nursing care, offering fee relief (in proportion to need) to low- or middle-income disabled elderly who employ such devices or services.

5.5. Building a Virtuous Cycle of Tiered Training-Skill Assessment-Remuneration Incentives

From the survey, it is clear that two basic flaws exist in today's workforce development arrangements—too little tiered training (48.6%) and too low a salary satisfaction (34.7%). To meet both of these needs at once, we suggest a joined-up solution involving training, certification, and pay.

First, nursing aides need to be divided into three tiers—novice, proficient, and senior—with classification based on length of service, on-the-job skill, and duties, each tier being matched to an individual training module. Second, the training itself must focus on practical problems (such as geriatric care, emergency action,

or risk avoidance) and not be too theoretical; it is best done with pairings of seniors and juniors or in scenario-based workshops. Third—and above all—assessment of training should bear directly on salary: certification at the intermediate level yields a monthly supplement, while senior-level success opens up the institutional reserve management system.

To support this reform, local governments could establish special training subsidy funds that reward aides who obtain national vocational skill certificates. Over the long term, vocational colleges and elderly care institutions should collaborate on apprenticeship-based “order training” programs to produce a pipeline of younger, formally trained care workers—addressing the talent shortage from its source rather than patching it after the fact.

Ethics Approval and Consent to Participate

This study was conducted in accordance with the Declaration of Helsinki. Ethical approval was obtained from the Institutional Review Board of Liuzhou Civil Affairs Bureau. All elderly participants provided written informed consent prior to participation; for those with cognitive limitations, consent was obtained from their legal guardians. Nursing aide participants provided electronic informed consent via the Wenjuanxing platform before completing the questionnaire. All data were anonymized prior to analysis to protect participant confidentiality. The study posed no more than minimal risk to participants.

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Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request. The data are not publicly available due to privacy or ethical restrictions, as they contain information that could compromise the privacy of research participants.

Conflicts of Interest

The authors declare that they have no competing interests. Although the first author (Qiuli LIANG) is affiliated with Liugang Xianyuan Health Industry Co., Ltd. and the corresponding author (Liyun QIU) is affiliated with Liuzhou Social Welfare Institute, these affiliations did not influence the study design, data collection, analysis, interpretation of findings, or the decision to submit the manuscript for publication. The survey instruments, data collection procedures, and analytical approaches were independently designed and executed by the research team.

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