RESEARCH PAPER

Effectiveness of a Rehabilitative Nursing Care Bundle on Activities of Daily Living Among Post-Acute Cerebrovascular Accident Patients: A Quasi-Experimental Study

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ABSTRACT

Post-acute cerebrovascular accident (CVA) survivors frequently experience limitations in Activities of Daily Living (ADL), contributing to long-term disability and reduced quality of life. Structured rehabilitative nursing interventions may enhance functional independence during early recovery. The main objective is to evaluate the effectiveness of a rehabilitative nursing care bundle on ADL performance among post-acute CVA patients in the experimental group. A non-randomized quasi-experimental post-test–only control group design was used. A total of 120 post-acute ischemic stroke patients (n=60 experimental; n=60 control) were recruited from two tertiary hospitals in Meerut, India. The experimental group received a 10-day rehabilitative nursing care bundle incorporating ADL training, mirror therapy, mobility exercises, and caregiver education. ADL performance was assessed using the Katz Index of Independence in Activities of Daily Living. Descriptive and inferential statistics, including paired and unpaired t-tests, were applied. The results are at baseline, both groups demonstrated comparable ADL dependence (experimental mean=1.90±0.77; control mean=1.95±0.72). Following intervention, the experimental group showed a significant improvement in ADL independence (mean=4.97±0.66; $p<0.001$). The rehabilitative nursing care bundle was highly effective in improving ADL performance among post-acute CVA patients. Early, structured, nurse-led rehabilitation significantly enhances functional independence and may reduce long-term disability.

Keywords: cerebrovascular accident, stroke rehabilitation, nursing care bundle, activities of daily living, functional recovery, quasi-experimental study.

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1. INTRODUCTION

Cerebrovascular accident (CVA) is a leading cause of long-term disability worldwide, contributing substantially to functional dependence and reduced quality of life among survivors [1,2]. Functional dependence in Activities of Daily Living (ADL) is common during the post-acute phase, often resulting in reduced autonomy, increased caregiver burden, and diminished psychosocial well-being [3–5]. Early rehabilitation is essential to optimize neuroplasticity and functional recovery, as evidence shows that timely, structured interventions significantly influence motor relearning and functional outcomes [2,6,7]. Nursing-led rehabilitative interventions, when systematically designed and consistently delivered, may accelerate ADL improvement and support safer transitions across care settings [8–10]. This study evaluates the effectiveness of a rehabilitative nursing care bundle on ADL performance among post-acute CVA patients.

Regaining independence in ADL is one of the most critical determinants of long-term recovery and quality of life following a cerebrovascular accident. ADL performance reflects the patient's ability to engage in essential self-care tasks such as feeding, grooming, bathing, toileting, and mobility—functions that directly influence dignity, autonomy, and psychosocial well-being [4,5]. Impairments in ADL not only increase caregiver burden but also predict institutionalization, recurrent hospitalizations, and reduced community reintegration [5,11].

Despite advances in acute stroke management, the early post-acute phase remains a vulnerable period during which functional decline can progress rapidly without structured rehabilitative support [2,7]. In many low- and middle-income settings, including India, gaps persist in standardized nursing-led rehabilitation protocols, resulting in inconsistent ADL recovery outcomes [12]. Nursing professionals, who remain in closest contact with

patients throughout hospitalization and early recovery, are uniquely positioned to deliver targeted interventions that reinforce motor relearning, promote neuroplasticity, and support safe performance of daily tasks [8–10].

The rehabilitative nursing care bundle used in this study integrates evidence-based strategies such as ADL-focused training, caregiver education, mobility facilitation, and structured practice routines. Evaluating its effectiveness on ADL outcomes is essential to determine whether such a bundled approach can accelerate functional independence, reduce dependency levels, and enhance overall recovery trajectories among post-acute CVA patients. By systematically assessing ADL improvements, this objective provides critical insight into the practical value of nursing-driven rehabilitation and its potential for integration into routine secondary-level stroke care [9,10,13,14].

2. METHODOLOGY:

2.1 Study Design

A non-randomized quasi-experimental post-test–only control group design was employed to evaluate the effectiveness of the rehabilitative nursing care bundle on Activities of Daily Living (ADL) among post-acute cerebrovascular accident (CVA) patients. This design was selected because random allocation was not feasible within the clinical setting, yet a comparison between intervention and routine-care groups was essential to determine treatment effects. Participants were assigned to the experimental or control group based on hospital site to prevent contamination between groups. Both groups underwent baseline eligibility screening, after which only the experimental group received the structured rehabilitative nursing care bundle. ADL outcomes were assessed at the end of the intervention period, allowing direct comparison of functional performance between groups under real-world clinical conditions.

2.2 Setting and Participants

The study was conducted in two comparable tertiary-level healthcare facilities in Meerut, Uttar Pradesh, each providing specialized neuromedicine services and dedicated stroke care units. To prevent treatment contamination, one facility was designated for the intervention group and the other for the control group. A total of 120 post-acute ischemic stroke patients were recruited through convenience sampling, with 60 participants allocated to each group**.**

Eligible participants were adults aged 25–70 years, medically stable, and within 7–14 days following acute stroke management**.** Additional inclusion criteria required the ability to follow simple verbal instructions and confirmation of stroke severity using standardized clinical assessments: a National Institutes of Health Stroke Scale (NIHSS) score of ≥14 and Brunnstrom Motor Recovery Stage III or IV. Patients with cognitive impairment, unstable medical conditions, or comorbidities limiting upper-limb or mobility training were excluded. All participants provided informed consent prior to enrollment.

2.3 Interventions:

The Rehabilitative Nursing Care Bundle (RNCB) was a structured, evidence-based intervention developed through an extensive review of current rehabilitation literature and validated by a multidisciplinary panel of neurologists, physiotherapists, and rehabilitation nurses. The intervention integrated mirror therapy, ADL compliance training, caregiver education, and follow-up reinforcement to enhance functional recovery among post-acute CVA patients. Mirror therapy was administered for 20 minutes daily and progressed systematically: during Week 1, patients practiced identifying the affected limb within the mirror box and performed simple unilateral movements such as finger tapping and wrist flexion–extension; in Week 2, they advanced to basic range-of-motion exercises for the fingers, wrist, and arm; and during Weeks 3 and 4, they engaged in functional task training involving object grasping and graded-weight handling. ADL compliance training was delivered for 10 minutes each day using a structured self-care booklet that addressed essential domains including nutrition, bowel and bladder habits, dressing and grooming, oral hygiene, communication, and vision care. Caregivers received parallel instruction to support and reinforce ADL practice at home. To maintain continuity and motivation, telephone-based follow-up reinforcement was provided for an additional two weeks after the initial intervention period. In total, the RNCB was delivered for 30 minutes per day over 10 consecutive days, followed by two weeks of home-based reinforcement. Participants in the control group received routine stroke care without exposure to the RNCB.

2.4 Outcome Measures

The primary outcome of the study was the level of independence in Activities of Daily Living (ADL), assessed using the Katz Index of Independence in Activities of Daily Living, which evaluates six essential self-care functions: bathing, dressing, toileting, transferring, continence, and feeding. Higher scores indicate greater independence.

2.5 Data Analysis

Data were analyzed using both descriptive and inferential statistics to evaluate the effectiveness of the rehabilitative nursing care bundle. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to summarize demographic characteristics and baseline clinical variables. Inferential statistics were applied to test the study hypotheses: an independent t-test compared post-test ADL scores between the experimental and control groups, while a paired t-test assessed pre- and

post-intervention changes within groups. The chi-square test examined associations between ADL levels and selected demographic and clinical variables, and Pearson correlation was used to explore relationships among ADL performance, mobility, and stroke recovery measures. A significance level of **$p < 0.05$** was used for all statistical tests.

3. RESULTS:

3.1 Demographic and Clinical Characteristics

A total of 120 post-acute CVA patients were enrolled (60 experimental, 60 control). Both groups were comparable in age, gender, marital status, income, socioeconomic status, type of CVA, upper motor function, premorbid conditions, and stroke severity ($p > 0.05$). Significant differences were noted in domicile, education, occupation, and personal habits ($p < 0.05$), which were considered during interpretation.

3.2 Baseline Activities of Daily Living (ADL)

At pre-test, both groups showed similar ADL dependency levels. In the experimental group, 81.7% were moderately dependent and 18.3% mildly dependent; the control group showed a similar pattern (80% moderately dependent, 20% mildly dependent). No participants were independent at baseline.

Table 1: Pre-intervention ADL levels:

Level of Activities of Daily Living	Experimental group		Control group	
	Pre test		Pre test	
	f	%	f	%
Fully dependent	0	0	0	0
Moderate	49	81.7	48	80
Mild	11	18.3	12	20
Independent	0	0	0	0
Overall	60	100	60	100

3.3 Post-Intervention ADL Outcomes

Table 2: Post-Intervention ADL Level:

Level of Activities of Daily Living	Experimental group		Control group	
	Post test		Post test	
	f	%	f	%
Fully dependent	0	0	0	0
Moderate	0	0	49	81.7
Mild	14	23.3	11	18.33
Independent	46	76.7	0	0

Overall	**60**	**100**	**60**	**100**

After the rehabilitative nursing care bundle, the experimental group showed substantial improvement, with 76.7% achieving independence and 23.3% mild dependence. No participants remained moderately dependent. The control group showed no meaningful improvement. The difference between groups was statistically significant ($p < 0.001$).

3.4 Stroke Severity Outcomes

Table 3: **Frequency and percentage wise distribution to evaluate the level of Health stroke Scale of outcome of rehabilitative nursing care bundle among patients with post-acute CVA**

Level of Health stroke Scale	Experimental group				Control group			
	Pre test		Post test		Pre test		Post test	
	f	%	f	%	f	%	f	%
No	0	0	5	8.3	0	0	0	0
Minor	0	0	25	41.7	0	0	0	0
Moderate	0	0	30	50	0	0	0	0
Moderate to Severe	7	11.7	0	0	9	15	9	15
Severe	53	88.3	0	0	51	85	51	85

At baseline, most participants were classified as severe (experimental: 88.3%, control: 85%). Post-intervention, the experimental group showed a dramatic shift to 0% severe, 50% moderate, 41.7% minor, and 8.3% no symptoms. The control group showed no change. Improvements were statistically significant ($p < 0.001$).

3.5 Stroke Recovery Outcomes

Pre-test recovery levels were similar across groups. After the intervention, 81.7% of the experimental group achieved good recovery, while the control group showed no improvement. The difference was highly significant ($p < 0.001$).

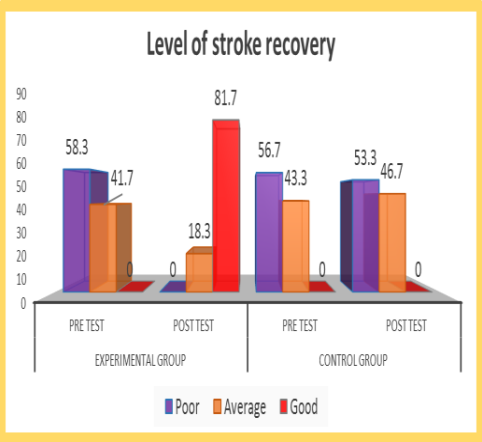

Fig.1: Level of stroke recovery

3.6 Mean Score Comparisons

Table 4: **Overall Mean and SD wise distribution to evaluate the Level of Activities of Daily Living in control group of outcomes of rehabilitative nursing care bundle among patients with post-acute CVA.**

Level of Activities of Daily Living	Max score	Control-pretest scores			Control - Post test scores			Difference in Mean%
		Mean	SD	Mean%	Mean	SD	Mean%	
Overall	6	1.95	0.72	32.5	1.97	0.69	32.8	0.3

Pre-test: The mean ADL score was **1.95 (SD = 0.72)**, corresponding to **32.5%** of the maximum possible score (6). **Post-test:** The mean score was **1.97 (SD = 0.69)**, corresponding to **32.8%**. **Difference:** The mean percentage improved only by **0.3%**, which is negligible. **Interpretation:** Patients in the control group showed almost no improvement in their level of Activities of Daily Living. Routine care did not contribute meaningfully to functional recovery.

Table 5: **Overall Mean and SD wise distribution to evaluate the Level of Activities of Daily Living in experimental group of outcomes of rehabilitative nursing care bundle among patients with post-acute CVA.**

Level of Activities of Daily Living	Max score	Experimental -Pretest scores			Experimental - Post test scores			Difference in Mean%
		Mean	SD	Mean%	Mean	SD	Mean%	
Overall	6	1.9	0.77	31.7	4.97	0.66	82.8	51.1

Pre-test: The mean ADL score was **1.9 (SD = 0.77)**, corresponding to **31.7%** of the maximum score. **Post-test:** The mean score increased dramatically to **4.97 (SD = 0.66)**, corresponding to **82.8%**. **Difference:** The mean percentage improved by **51.1%**, which is substantial. **Interpretation:** Patients in the experimental group demonstrated a significant improvement in ADL following the rehabilitative nursing care bundle. The intervention was effective in enhancing independence and functional ability. The analysis highlights the effectiveness of structured rehabilitative nursing interventions in post-acute CVA patients. In contrast, the control group remained static. This finding supports the hypothesis that nursing care bundles accelerate recovery by promoting self-care, mobility, and independence.

Table 6: **Overall Mean and SD wise distribution to evaluate the Level of Activities of Daily Living between control and experimental group posttest of outcome of rehabilitative nursing care bundle among patients with post-acute CVA.**

Level of Activities of Daily Living	Max score	Experimental -post test scores			Control - Post test scores			Difference in Mean%
		Mean	SD	Mean%	Mean	SD	Mean%	
Overall	6	4.97	0.66	82.8	1.97	0.69	32.8	50

Experimental group: Mean ADL score increased to **4.97 (SD = 0.66)**, corresponding to **82.8%** of the maximum score, **Control group:** Mean ADL score remained almost unchanged at **1.97 (SD = 0.69)**, corresponding to **32.8%**, **Difference in Mean%:** A substantial **50%** difference between groups. **Interpretation:** After the intervention, the experimental group demonstrated a dramatic improvement in ADL, while the control group showed no

meaningful change. The rehabilitative nursing care bundle was highly effective in enhancing independence and functional ability. These findings support the hypothesis that structured nursing interventions accelerate recovery by promoting self-care, mobility, and independence. They also align with rehabilitation theories emphasizing neuroplasticity and the role of consistent, targeted interventions in functional recovery. Thus, the rehabilitative nursing care bundle can be considered a vital strategy for improving Activities of Daily Living, reducing caregiver burden, and enhancing quality of life in stroke survivors.

3.7 Correlation Analysis

Table 7**: Correlation between level of ADL, Health stroke scale and stroke recovery.**

Experimental group	Variables	ADL-HEALTH Stoke Scale	ADL- stroke recovery	HEALTH Stoke Scale-stroke recovery
Experimental group -pre test	'r'-value	0.039	-0.106	0.042
	p-value	0.766(NS)	0.421(NS)	0.747(NS)
Experimental group - post test	'r'-value	-0.665	0.599	-0.420
	p-value	p<0.001***(HS)	p<0.001***(HS)	p<0.0001***(HS)
Control group				
Control group - pre test	'r'-value	0.083	0.001	-0.044
	p-value	0.528(NS)	0.995(NS)	0.740(NS)
Control group - post test	'r'-value	0.007	0.047	0.039
	p-value	0.955 (NS)	0.716(NS)	0.762(NS)

*HS – Highly Significant, NS- Non-significant

Table 7 presents the correlation analysis between **Activities of Daily Living (ADL)**, **Health Stroke Scale**, and **stroke recovery outcomes** for both the experimental and control groups.

In the **experimental group pre-test**, the correlation coefficients between ADL and Health Stroke Scale (r = 0.039, p = 0.766), ADL and stroke recovery (r = –0.106, p = 0.421), and Health Stroke Scale and stroke recovery (r = 0.042, p = 0.747) were all statistically non-significant. This indicates that prior to the intervention, there was no meaningful association between these variables, reflecting the baseline condition of patients.

In contrast, the **experimental group post-test** demonstrated strong and statistically significant correlations. ADL was negatively correlated with Health Stroke Scale (r = –0.665, p < 0.001), positively correlated with stroke recovery (r = 0.599, p < 0.001), and Health Stroke Scale was negatively correlated with stroke recovery (r = –0.420, p < 0.0001). These findings suggest that after the implementation of the rehabilitative nursing care bundle, improvements in ADL were associated with better stroke recovery, while higher Health Stroke Scale scores (indicating greater impairment) were inversely related to recovery outcomes. This pattern highlights the effectiveness of the intervention in strengthening functional independence and recovery.

For the **control group**, both pre-test and post-test correlations were weak and statistically non-significant. Pre-test correlations included ADL–Health Stroke Scale (r = 0.083, p = 0.528), ADL–stroke recovery (r = 0.001, p = 0.995), and Health Stroke Scale–stroke recovery (r = –0.044, p = 0.740). Post-test correlations remained

negligible, with ADL–Health Stroke Scale ($r = 0.007$, $p = 0.955$), ADL–stroke recovery ($r = 0.047$, $p = 0.716$), and Health Stroke Scale–stroke recovery ($r = 0.039$, $p = 0.762$). These results confirm that without the structured nursing intervention, no significant associations emerged between functional status, health scale scores, and recovery outcomes.

The correlation analysis underscores the **impact of rehabilitative nursing care bundles** in the experimental group, where significant associations emerged post-intervention, linking improved ADL performance with enhanced recovery and reduced impairment. In contrast, the control group showed no meaningful correlations, reinforcing the conclusion that structured nursing interventions are essential for promoting functional recovery and independence among post-acute CVA patients.

3.8 Association with Demographic and Clinical Variables

Table 8: **Association between level of ADL in experimental group of pretest and Selected Demographic data.**

Demographic variables	EXPERIMENTAL GROUP (Kruskal Wallis test)			
	n	Mean±SD	$\chi 2$ Value	P-Value
1.Age in years:				
31-35 years	4	2.25±0.5	$\chi 2$=1.796 (df=3)	p=0.616 NS
36-40 years	7	1.71±0.48		
41-45 years	26	1.81±0.69		
46-50 years	23	2.0±0.95		
2.Gender:				
Male	33	1.91±0.84	$\chi 2$=0.024 (df=1)	p=0.878 NS
Female	27	1.89±0.69		
Transgender	0	0		
3. Marital status: Married Unmarried Divorce widower/widow	45 0 6 9	1.91±0.85 0 1.67±0.52 2.0±0.5	$\chi 2$=0.826 (df=2)	p=0.662 NS
4.Domicile: Urban Rural Semi urban	22 22 16	1.68±0.65 1.82±0.59 2.31±1.01	$\chi 2$=4.764 (df=2)	p=0.092 NS
5.Education: Illiterate Primary Middle High school Higher secondary	32 19 8 1 0	1.94±0.72 1.84±0.76 2.0±1.06 1.0±0 0	$\chi 2$=2.025 (df=3)	P=0.567 HS
6.Occupation: Govt.employe Agriculture Self employee No work	27 19 14 0	1.85±0.72 1.95±0.85 1.93±0.83 0	$\chi 2$=0.066 (df=2)	0.967 NS
7. Income per month: <2000 2001-5000 50001-10000 >10000	10 14 21 15	1.50±0.53 1.86±0.66 1.90±0.7 2.20±1.01	$\chi 2$=3.994 (df=3)	P=0.262 NS
8. Socio economic status:				

Upper Middle Lower	0 39 21	0 1.90±0.78 1.90±0.76	χ^2=0.029 (df=1)	0.866 NS
9.Personal habits: Smoking Alcohol Tobacco use Smoking and Alcohol None	 20 11 16 13 0	 2.10±0.60 2.18±0.60 1.63±0.5 1.69±0.94 0	χ^2=6.77 (df=3)	0.079 NS
10. Type of CVA: Thrombotic Embolic TIA	 21 20 19	 1.81±0.60 1.85±0.81 2.05±0.91	χ^2=0.545 (df=2)	0.762 NS
11. Level of upper motor function as per burn storm recovery scale: Stage III Stage IV	 24 36	 2.0±0.83 1.83±0.74	χ^2=0.599 (df=1)	P=0.439 NS
12. Pre morbid condition: Hypertension Diabetes mellitus Hypertension & diabetes Previous history of TIA, MI Hypercholesterolemia Cardiopathy, LVH, CCF, CAD, AF	 17 8 13 0 12 10	 1.59±0.62 1.75±0.71 1.92±0.76 0 2.17±0.84 2.20±0.92	χ^2=5.457 (df=4)	p=0.244 NS
13. Severity of stroke as per NIHSS: Mild Mild to moderate Severe Very severe	 13 23 22 2	 1.85±0.98 1.96±0.64 1.86±0.83 2.0±0	χ^2=0.903 (df=3)	p=0.825 NS

NS-Not significant, S-significant.

Table No. 8 depicts the association between the level of Activities of Daily Living (ADL) in the experimental group during the pretest and selected demographic as well as clinical variables, analyzed using the Kruskal–Wallis test. The analysis demonstrates that none of the demographic or clinical characteristics exerted a statistically significant influence on baseline ADL scores, as all p-values exceeded the 0.05 threshold. In summary, the analysis confirms that demographic and clinical variables did not significantly influence ADL levels in the experimental group at baseline.

4. DISCUSSION

The findings of this study demonstrate that the rehabilitative nursing care bundle (RNCB) produced significant improvements in functional outcomes among post-acute CVA patients. The marked increase in independence in Activities of Daily Living (ADL) in the experimental group, compared with no meaningful change in the control group, highlights the effectiveness of structured, nurse-led rehabilitation in restoring self-care abilities. These results support existing evidence that early, repetitive, task-oriented training enhances neuroplasticity and functional recovery in stroke survivors.

The substantial reduction in stroke severity and the shift from severe to minor or no symptoms in the experimental group further emphasize the therapeutic value of combining mirror therapy, ADL training, caregiver involvement, and follow-up reinforcement. This aligns with previous research indicating that multisensory stimulation and functional task practice accelerate neurological recovery. The significant improvement in stroke recovery scores, with over 80% of the experimental group achieving good recovery, reinforces the importance of integrating nursing-driven rehabilitation strategies into routine stroke care.

Correlation analysis revealed strong associations between improved ADL performance, reduced stroke severity, and enhanced recovery, suggesting that gains in daily functioning are closely linked to neurological improvement. The absence of such correlations in the control group underscores the impact of the intervention rather than natural recovery alone. Additionally, the lack of association between ADL outcomes and demographic

or clinical variables confirms that the RNCB was effective across diverse patient profiles.

Overall, the study highlights the critical role of nurses in delivering structured rehabilitation, educating caregivers, and ensuring continuity of care through follow-up support. The RNCB offers a practical, scalable model that can be integrated into post-acute stroke management to improve functional independence and quality of life.

5. CONCLUSION

The study demonstrated that the rehabilitative nursing care bundle was highly effective in improving functional independence, reducing stroke severity, and enhancing overall recovery among post-acute CVA patients. Participants who received the intervention showed significant gains in Activities of Daily Living, mobility, and neurological recovery compared with those receiving routine care. These improvements were independent of demographic or clinical characteristics, indicating that the intervention is broadly applicable across diverse patient groups. The findings highlight the essential role of structured, nurse-led rehabilitation and caregiver involvement in optimizing post-stroke outcomes and support the integration of such bundled interventions into routine stroke care to improve quality of life and long-term recovery.

Implications for Practice:

The rehabilitative nursing care bundle can be integrated into routine stroke care to enhance ADL performance, mobility, and overall recovery. Nurses can use this bundle to guide early functional training, reinforce self-care skills, and actively involve caregivers in the rehabilitation process. The results also emphasize the importance of consistent follow-up and patient motivation, suggesting that nurse-led telephone reinforcement can significantly improve continuity of care. Implementing such structured interventions in clinical and community settings may reduce long-term disability, improve quality of life, and support more efficient stroke recovery pathways.

Declarations:

Conflict of Interest:

The authors declare that there is no conflict of interest regarding the conduct, analysis, authorship, or publication of this research study. No financial, professional, or personal relationships influenced the outcomes or interpretations presented herein. This study was carried out purely for academic and research purposes, following the ethical standards of the institution.

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Ethical Approval:

Ethical clearance for conducting this study was obtained from the Institutional Ethics Committee (IEC) of Swami Vivekanand Subharti University, Meerut, UP. All participants were informed about the objectives of the study, and informed consent was obtained prior to data collection. Confidentiality and anonymity were maintained throughout the research process, in accordance with the Declaration of Helsinki (2013) ethical principles for research involving human subjects.

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