


Original Article

Magnesium sulfate versus Tramadol pretreatment in the attenuation of Hemodynamic Responses and Post-intubation Analgesia to laryngoscopy & Endotracheal Intubation

DOI: dx.doi.org

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Received: 06 APR 2022

Accepted: 19 APR 2022

Published: 20 APR 2022

Published by:

Sheikh Sayera Khatun Medical
College Gopalganj, Bangladesh



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**ABSTRACT**

Introduction: Cardiovascular stress secondary to endotracheal intubation during surgical procedures requiring general anesthesia, can be critical to manage per-operatively which mandates for pre-intubation stress attenuation preventive measures. The aim of the study was to observe the effects of two drugs as preemptive analgesia on hemodynamics and post-operative pain.

Methods: This prospective observational study was conducted in the Department of Anesthesia, Analgesia, Palliative and Intensive care Medicine of a tertiary level govt. hospital of Dhaka, Bangladesh, during the period of July 2018 to June 2019. Total fifty (50) patients belonging to ASA physical status I were randomized into Group A and Group B where 25 patients in Group A received Inj MgSO₄ (40mg/kg) & 25 patients in Group B received inj. Tramadol (0.6mg/kg). VAS score has been recorded.

Result: The systolic and diastolic blood pressure among the groups showed that Group B patients exacerbated the immediate rise in BP after intubation followed by a fall in BP whereas Group A patients showed consistent fall in BP. These changes were statistically significant at the readings after 1 minute and after 3 minutes for systolic blood pressure and at all readings for diastolic blood pressure ($p < 0.05$). On different readings at different time intervals, Group B showed a comparatively lower mean of VAS score than that of Group A, where this difference was statistically significant at T1 ($p < 0.05$). First rescue analgesia

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within the 1st hour of reversal was demanded by 8.00% of the patients from Group A and no patients from Group B ($p>0.05$). **Conclusion:** Although I/V Tramadol was found to produce better postoperative analgesia, I/V Magnesium Sulfate was comparatively more compensatory to combat blood pressure increase after intubation during surgical procedures under general anesthesia.

Keywords: Endotracheal intubation, Hemodynamics, Analgesia, MgSO₄, Tramadol

(The Insight 2021; 4(2): 81-88)

INTRODUCTION

Laryngoscopy and endotracheal intubation are invariably associated with certain stress responses in the human body by causing catecholamine release due to sympathy-adrenal stimulation [1]. These stress responses are signified by a quick transient rise in the blood pressure and heart rate (HR), which gradually returns to the baseline values within 5–10 min [2]. A healthy individual may not be affected significantly by these stress responses, but patients with cardiovascular insufficiency and cerebrovascular diseases or patients with reactive airways may experience detrimental consequences which may evolve as a per-operative crisis [3]. Therefore, in the surgical procedures requiring general anesthesia, laryngeal stress response during endotracheal intubation and post-operative pain stress is one of the major concerns [4]. Several drugs and techniques are there in practice to combat these stress responses, which exhibited contradictory results in terms of controlling hemodynamic stability [5]. The risks of hemodynamic pressure response can be obtunded by appropriate premedication, smooth induction, and rapid intubation. Various pharmacological methods are evaluated either in the premedication or during induction to attenuate these adverse hemodynamic responses of laryngoscopy and intubation. Among these medications, magnesium sulfate is

progressively being recognized for its physiological and pharmacological mechanism of action, as well as for its clinical use to attenuate stress response to laryngoscopy and intubation by blocking catecholamines from adrenergic nerve terminals and adrenal gland and for its coronary and peripheral vasodilator properties [6]. Though, MgSO₄ doesn't have any convincing evidence to support the analgesic efficacy when used as the premedication to general anesthesia and intubation. On the other hand, superior analgesic efficacy and soporific property make opioids a better choice to be used as a part of premedication in G/A. Opioids maintain hemodynamics at the time of laryngoscopy by suppressing the release of sympathomimetic agents and providing analgesia by their action on pain receptors. Although opioid analgesic provides strong analgesic effects, their use is associated with many side effects such as sedation, nausea, vomiting, respiratory depression, gut disturbances [7]. Recently, several studies have demonstrated the role of tramadol in the attenuation of the hemodynamic stress response.[4,8]. It has not been associated with clinically significant respiratory depression and has a low potential for the development of tolerance, dependence, or abuse and other common side effects of opioids thus overcoming the common side effects of older opioids. It also has good analgesic properties in the immediate

post-operative period [9]. As, better attenuation to stress response along with better analgesic property are the two most claimed requirements of a preemptive drug in endotracheal intubation procedure, therefore, the present study made an effort to observe the differences of I/V MgSo4 or I/V Tramadol in the attenuation of hemodynamic response and to perceive their comparative analgesic sustenance to intubation.

OBJECTIVE

GENERAL OBJECTIVE

- To observe the effects of Magnesium sulfate in the attenuation of hemodynamic responses and post-intubation analgesia to laryngoscopy & endotracheal intubation
- To observe the effects of Tramadol pretreatment in the attenuation of hemodynamic responses and post-intubation analgesia to laryngoscopy & endotracheal intubation

METHODS

This prospective observational study was conducted in the Department of Anesthesia, Analgesia, Palliative and Intensive care Medicine of a tertiary level govt. hospital of Dhaka, Bangladesh, during the period of July 2018 to June 2019. Data was collected from purposively selected ASA grade I patients who met the selection criteria and who were admitted to the respective hospital for elective surgical procedures, requiring general anesthesia and

oro-tracheal intubation. Prior to conducting the study, ethical approval from the concerning authority and informed written consent from the selected patients have been availed. The selected patients were randomly divided into two groups (25 patients in each group) by using the sequentially numbered opaque sealed envelope technique with all the measures to avoid bias. All the patients were visited the night before surgery. They were kept on fasting for at least 6 hours according to their individualized schedule of operation. Before the scheduled time of operation, an intravenous line was secured by an 18G cannula after shifting the patients into the waiting area of the operation theatre. All the patients received a uniform premedication by Inj Ondansetron, Inj Ranitidine one hour prior to induction. On arrival of patients into the operation theatre, the patient's weight, baseline hemodynamics (Heart rate, Systolic, and Diastolic pressure) were monitored and recorded. Preemptive analgesia was established for all the patients in the form of intravenous Paracetamol (15 mg/kg) over 10 minutes prior to giving study drugs. For administration of the drugs, Group A patients were given Inj MgSO₄ (40 mg/kg) mixed with 0.9% normal saline (to make 20 ml solution), while Group B patients were given inj. Tramadol (0.6 mg/kg) mixed with 0.9% normal saline (to make 20 ml solution). Study drugs were given 25 minutes before the induction of general anesthesia at the rate of 20 drops/minute. Standardized procedures for intubation and per-operative anesthetic maintenance have been followed uniformly for all study patients. The Systolic and Diastolic pressure was recorded in 1 minute, 3 minutes, 5 minutes, and 10 minutes after intubation. Postoperative pain assessment was done by using the Visual

Analogue Scale. VAS scores were recorded postoperatively after 1 hour, 2 hours, 3 hours, 4 hours, and 6 hours. Rescue analgesia as inj. Pethidine (1mg/kg) I/M was given to the patients when they themselves complained of pain or when their VAS was >4. Time to 1st rescue analgesia was noted. After

completing each surgical event, the data were collected and filled in the pre-structured datasheet. After collecting and entering all the data, statistical analysis was performed by using SPSS (Statistical Package for the Social Sciences) version 26.

RESUL

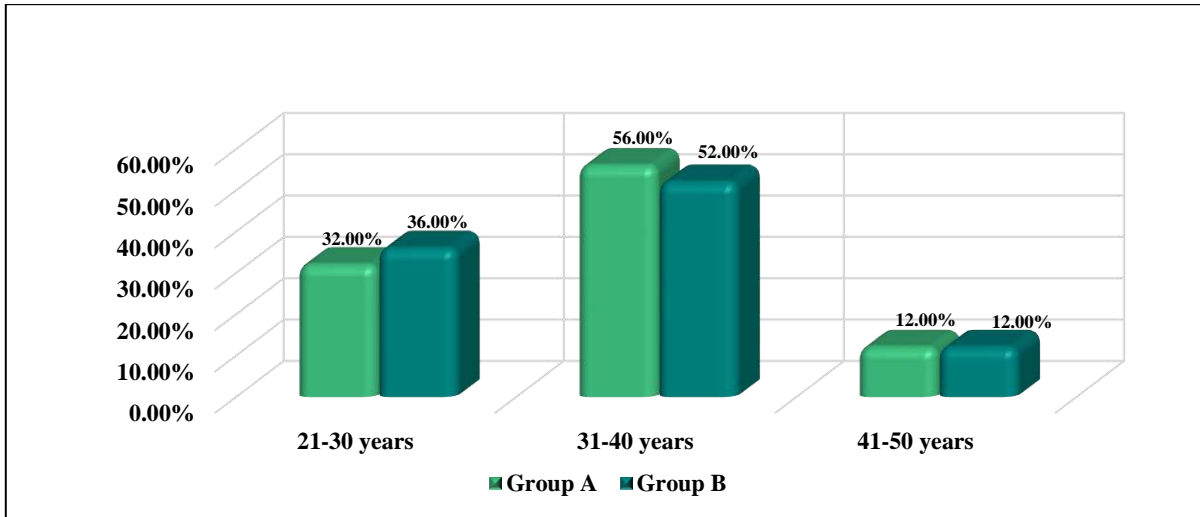


Figure 1: Distribution of study patients according to age(n=50)

The majority of the respondents under this study were aged between 31 to 40 years (group A: 56.00%, Group B:

52.00%), while very few were from the age group of 41-50 years (group A: 12.00%, Group B: 12.00%).

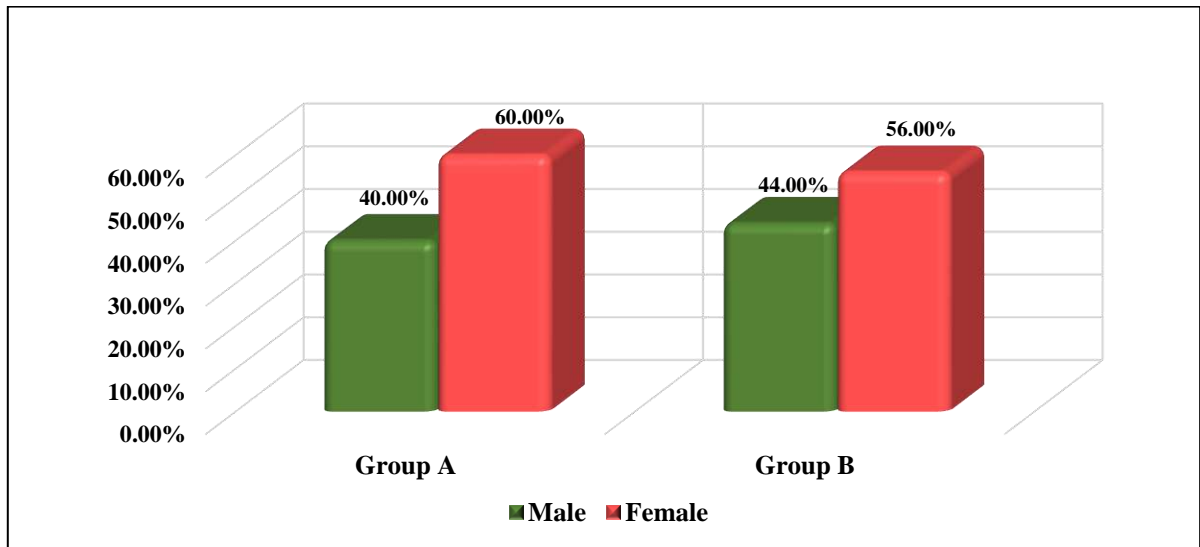


Figure 2: Distribution of the study patients according to gender (n=50)

In Group A, male and female respondents were 40.00% and 60.00% respectively

and in Group B, 44.00% and 56.00% respectively.

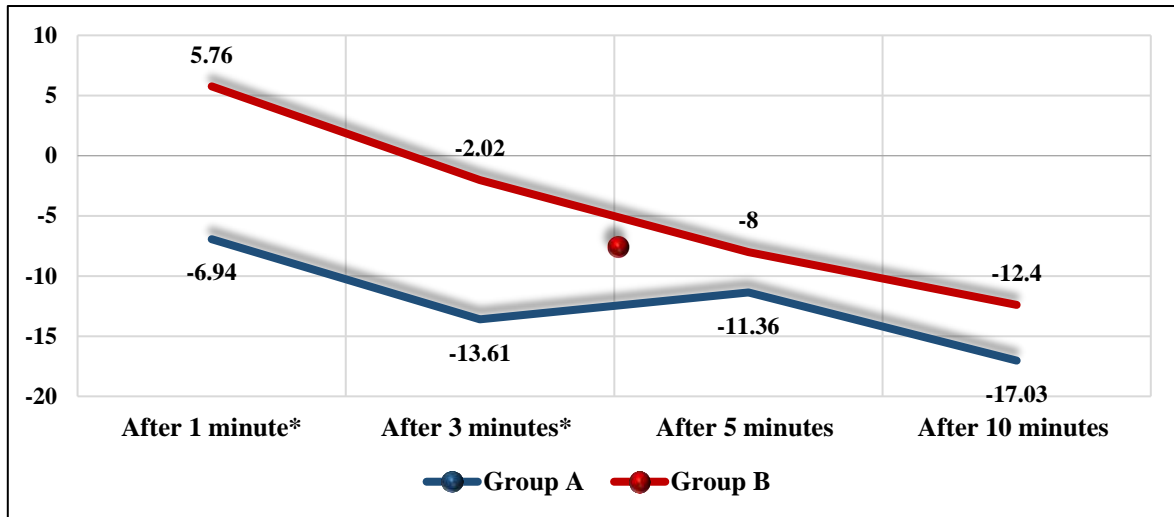


Figure 3: Post-intubation changes in the systolic blood pressure between Group A and B (mmHg) (n=50)

Systolic Blood Pressure (mmHg) changes after intubation in between two groups showed that, after 1 minute, there was a fall in mean SBP in Group A (-6.94 from baseline), and rise in mean SBP in Group B (+5.76 from baseline), where this changes in means between the groups were statistically significant (p<0.001).

Mean SBP changes after 3 minutes of intubation were also significant between the groups, were both in Group A and B there was a further fall in mean SBP from baseline (p<0.001). In both groups, no patient reached the critical point (SBP did not come below or above 20% from baseline data)

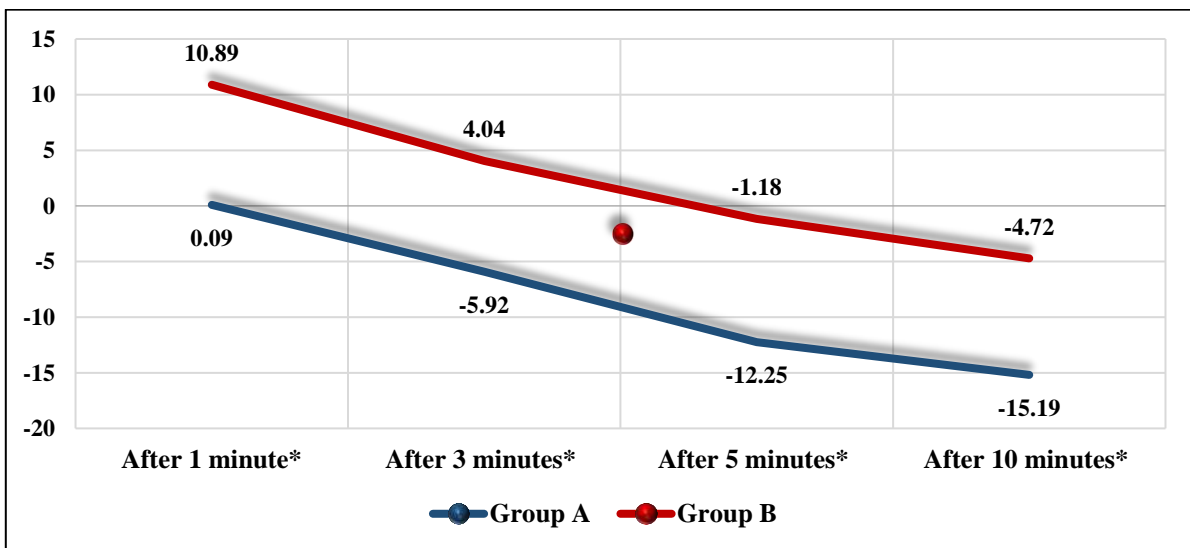


Figure 4: Post-intubation changes in the diastolic blood pressure between Group A and B (mmHg) (n=50)

Diastolic Blood Pressure (mmHg) changes after intubation in between two groups showed that mean DBP changes were observed in Group A after 1 minute there was a very slight rise (0.09 from baseline), thereafter there was a

continuous fall in mean DBP, such as, after 3 minutes there was 5.92 mmHg fall from baseline, after 5 minutes there was 12.25 mmHg fall from baseline and after 10 minutes there was 15.19 mmHg fall from baseline. In Group B, there was a

fall in DBP after 1 minute by 10.89 mmHg fall from baseline, after 3 minutes by 4.04 mmHg fall from baseline, after 5 minutes 1.18 mmHg fall from baseline and after 10 minutes 4.72 mmHg fall from

baseline. DBP changes after intubation in between two groups were statistically significant ($p < 0.05$), but none of the patients either reached the critical value (not above or below 20% from baseline)

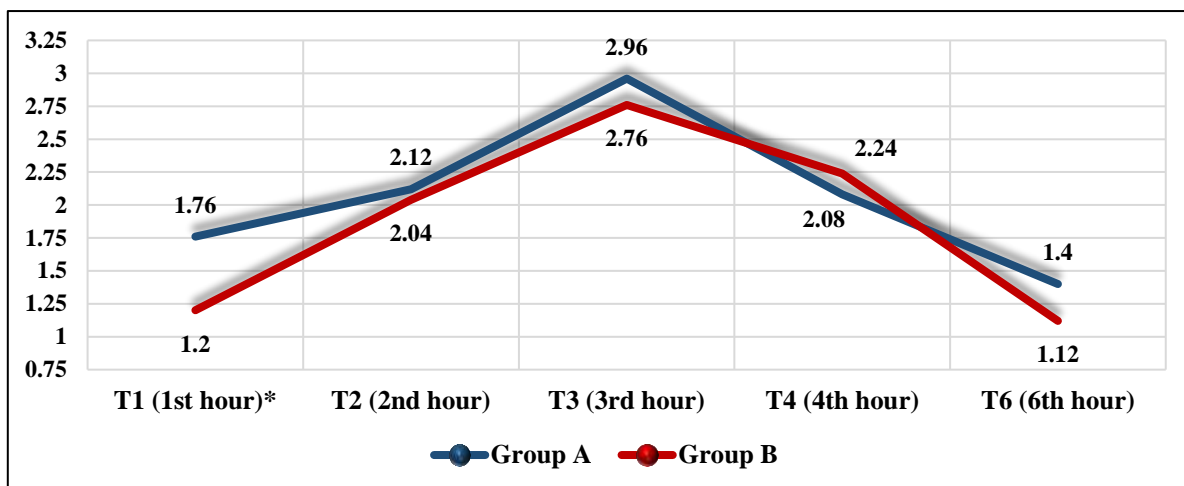


Figure 5: Postoperative VAS score between Group A and B (n=50)

On different readings at different time intervals, Group B showed a comparatively lower mean of VAS score

than that of Group A, where this difference was statistically significant at T1 ($p < 0.05$).

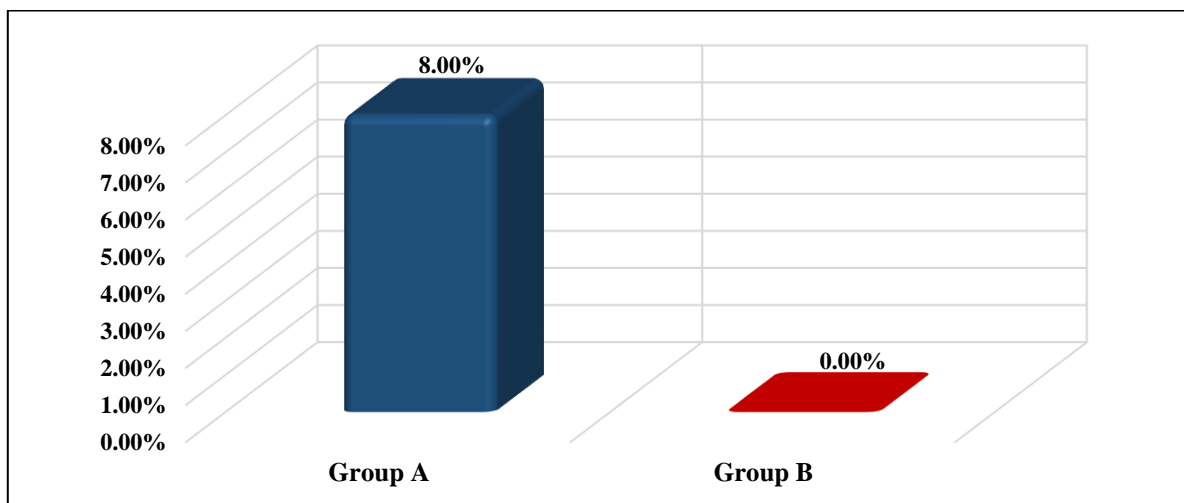


Figure 6: Post-operative rescue analgesic requirement in the first hour between Group A and Group B (n=50)

First rescue analgesia was demanded by 4 patients (8.00%) from Group A and no patients from Group B within the 1st hour of reversal ($p > 0.05$) (Figure 6).

evaluated among the two groups of patients where they have been given magnesium sulfate (Group A) and tramadol (Group B) as preemptive analgesia to attenuate post-intubation stress response. It has been observed that, in Group B, there was a significant rise in both mean systolic and mean diastolic blood pressure immediately

DISCUSSION

In this study, the hemodynamic stability, as well as post-operative pain, was

after intubation (1-minute post-intubation) compared to that of Group A ($p < 0.05$). On the subsequent readings, in both groups, systolic and diastolic pressure was found to have a fall where this fall from baseline was more in Group A than in Group B. Though none of the patients reached critical value for the changes of the blood pressure ($\pm 20\%$ from baseline), this immediate rise in BP may prove precarious for critically ill patients. $MgSO_4$ is recently being familiar with its role in preemptive analgesia to attenuate stress response to endotracheal intubation. In a recent study, the hemodynamic response to intubation among patients who were administered with $MgSO_4$ preemptively and compared that with a control group; they found that, the blood pressure was significantly higher after intubation among the control group [1]. They also observed that $MgSO_4$ at 40mg/kg dosage responded better in the stress attenuation than the 30mg/kg dosage significantly [10]. Several other studies also found that post-intubation cardiovascular stress response was insignificant among the patients who were administered $MgSO_4$ intravenously before intubation [11,12]. This response can be explained by the direct vasodilation effect of magnesium and its action on the sympathetic nervous system and its inhibitory effect on the release of catecholamine. Magnesium also reduces the responsiveness of vascular smooth muscles, to norepinephrine. Thus it stabilizes the stress response exerted by the endotracheal intubation [12,13]. On the other side, in Group B, the Tramadol group didn't show any better cardiovascular stress attenuation in comparison to $MgSO_4$ administration, which was corresponding with previous study findings where it had been observed that neither the chronotropic nor the inotropic post-intubation

response of intravenous administration of tramadol was significant [14]. Though this study found that, Tramadol served better postoperative analgesia in terms of VAS score and the Tramadol group didn't demand any rescue analgesia during the first hour postoperatively, whereas one case from Group A required analgesic rescue in the first hour postoperatively. Thus, Tramadol with Paracetamol was found to provide more analgesia than $MgSO_4$. Also in other studies, Tramadol was found to provide better postoperative analgesia when compared to other drugs such as Fentanyl;⁴ and $MgSO_4$ found to provide lesser postoperative analgesia when compared to other drugs such as paracetamol.¹⁵

Limitations of The Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

Although I/V Tramadol was found to produce better postoperative analgesia, I/V Magnesium Sulfate was comparatively more compensatory to combat blood pressure increase after intubation during surgical procedures under general anesthesia. Being a cheap and readily available alternative, magnesium sulfate can be utilized as the pre-treatment measure to attenuate the stressor response to tracheal intubation or laryngoscopy.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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