

# Evaluation of the Resuscitation of the Newborn in the Birth Room of the Maternity Ward of the Gynecology-Obstetrics Department of Reference Health Center (RHC) of the District V of Bamako, Mali

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## Abstract

Birth is the transition from fetal life to ectopic life. This transition is usually smooth. Only 10% of newborns will need birth assistance. Successful resuscitation is linked to the skills of the health worker. It is to assess their skills that this work was undertaken with the objective of evaluating the practice of neonatal resuscitation in the delivery room of the RHC maternity hospital in District V of Bamako. **Methodology:** This was a descriptive cross-sectional study over a four-month period. We included in the study all live newborns who had a gestational age greater than or equal to 32 weeks and who had an Apgar score at the first minute of less than 7. At each birth, we observe the health agent responsible for the care of the newborn by observing the preparation of resuscitation and compliance with the neonatal resuscitation algorithm. We have excluded all newborns who met our inclusion criteria, were reanimated outside of our collection time and had visible or diagnosed anomalies or malformations in the prenatal period, and those whose parents refused to give their consent to participate in the study. Data were collected from the survey sheet

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and analyzed with the Statistical Package for Social Sciences (SPSS) software version 25. **Results:** We observed a 24.66% frequency of neonatal resuscitation. Pregnancies were too close in 15% (less than one year). Caesarean section delivery represented 34% of the sample. They were at term in 93% of cases. All newborns were well dried (98.5%), with wet linen change only at 49.5%. Apgar was less than 3 in 7.5% of newborns at first. The resuscitation needs were for the absence of a scream in 78.5% of cases and or heart rate <100 beats/min or absence of heartbeat in 16% of cases. The stimulation practice was correctly done (99.5%), as well as the airway release (95%). Nearly half (49%) of the newborns were recovered at the end of the first stage of resuscitation. Out of the 102 neonates ventilated, 65 had recovered (63.7% success rate). During the cardiac massage associated with the ventilation mask performed in 37 newborns, the technique was correctly performed in 81% and the rhythm was adapted in 27/37 newborns in 73%. The score of Apgar at 5 min was between 7 and 10 in 95.5%. Resuscitation was stopped in 7 newborns (declared dead) and 42 newborns were transferred to neonatology for respiratory distress (85%). **Conclusion:** The study evaluated neonatal resuscitation practices at a maternity hospital in Bamako, Mali. It found a 24.66% resuscitation rate, with a 95.5% success rate despite technical limitations. Most steps were correctly applied, though some improvements are needed in areas like preventing hypothermia and equipment preparation.

## Keywords

Evaluation, Practice, Neonatal Resuscitation, Birth Room, Maternity Ward, District V, Bamako, Mali

## 1. Introduction

The chances of survival of a newborn depend on its place of birth. Thus, the first 28 days of life remain the most vulnerable period. During this period, approximately 2.3 million newborns died worldwide in 2021, or 6,400 deaths per day, of which 1.16 million occur on the African continent [1]-[4]. Nearly a quarter of all deaths occur within the first 24 hours of life [2] [3]. More than 80% of all neonatal deaths result from four preventable and treatable problems, namely premature complications in 35%, per-partum deaths (including birth asphyxia) in 24%, neonatal infections in 20% and malformations [5]. These conditions are promoted by the lack of quality care at birth or the absence of care or treatment by qualified personnel immediately after birth and in the first days of life [5]. As a result, a child born in sub-Saharan Africa is 11 times more likely to die within the first month of life than a child born in Europe or America [1]. The quality of care provided during this period by caregivers in health facilities and by parents in the community, is essential to improve newborn survival [6]-[8]. It is proven that neonatal resuscitation and essential care of the newborn are two measures to reduce this heavy burden through birth and postnatal interventions

[9]. Birth is a brutal transition between fetal life, where gas exchange is dependent on placental functions and neonatal life where hematosis must be quickly taken over by the lungs of the newborn. In most cases, this adaptation to the outside-the-womb life goes without problem. Indeed, about 10% of newborns will need birth assistance marked by simple resuscitation gestures (tactile stimulation, aspiration of the upper airways, ventilation...) and only 1% require more advanced resuscitation maneuvers [10]-[12]. The management of these newborns is now well codified, with international recommendations published and updated regularly [13] [14].

Mali is one of the eight countries with high neonatal mortality and perinatal asphyxia is a major cause of this mortality [4] [15]. To reduce its incidence, basic neonatal resuscitation in delivery rooms is required. Neonatal resuscitation is only effective when health professionals have sufficient skills [13] [14]. Hence the interest of this work whose main objective was to evaluate the practice of neonatal resuscitation in the maternity delivery room of Reference Health Center (RHC) of the District V of Bamako.

## 2. Methodology

Our study was conducted in the maternity ward of Reference Health Center (RHC) of the District V of Bamako. The gynecobstetric service of RHC of the District V is composed of two units which are the Gynecology and Obstetrics unit. It is located at the top (2nd level) of the health pyramid in the reference system/evacuation of Mali. He receives the gynecobstetric emergencies coming from these Community Health Centers (CHC) and other municipalities of Bamako and surroundings. It has an average capacity of 50 beds divided between: a room for pathological pregnancy, three rooms for postoperative, two VIP rooms, a room of suite of pathological layer, a room of suite of normal layer of pregnancy, and a room for intensive care. In 2022, the number of births on duty was 9,482 with 6,951 by the vaginal route, 2,531 by caesarean section and 769 newborns were reanimated. We conducted a cross-sectional study, which took place over a four-month period from 28 August to 28 December 2023. We included in the study all live births by vaginal delivery or cesarean section gestational age greater than or equal to 32 weeks of amenorrhea at maternity, whose Apgar score at the 1st minute was less than 7. And the person responsible for the care of the newborn by observing the preparation of resuscitation as well as compliance with the neonatal resuscitation algorithm at each birth. We excluded from the study, all newborns of gestational age greater than or equal to 32 Weeks of Amenorrhea who were reanimated outside our collection hours and or had obvious or diagnosed anomalies or malformations in the antenatal period and those whose parents refused to give their participation agreements in the study. The sample size (n) was calculated according to Schwartz's formula:  $n = Z(\alpha)^2 p q / i^2$  with p at 10%, and the minimum sample size was 80. By adding 20% of the sample size for unusable records, we rounded up  $n = 200$  newborns.

The collection of cases was carried out in the delivery room and the newborn corner of the operating room from Monday to Friday between 08:00 and 15:00. At each birth, the investigator was present at the reception of the newborn in the delivery room and or the operating room: to recruit cases meeting our criteria, observed the preparation of the reception of the newborn, the practice of resuscitation of the newborn. The health staff's attitude and respect for the steps. Thus, the clinical evaluation of neonatal adaptation before the introduction of possible resuscitation measures (algorithm) is based on the 4 criteria which are: Respiration, Heart Rate, Tone and Coloration. Variables studied were: newborn information (name, Apgar score, sex, gestational age of the newborn, weight, height, cranial circumference), delivery room information, resuscitation equipment preparation, information on the reception and resuscitation of the newborn and the administration of post-resuscitation care after successful resuscitation at different levels.

Thus, resuscitation of the newborn is defined as all the gestures and specialized care aimed at restoring and ensuring effective alveolar breathing [16].

Successful neonatal resuscitation is if the improvement in the newborn's clinical condition is judged by an increase in heart rate above 100, the coloration becomes pink and the breathing is regular and autonomous (especially the crying) [16].

We consider that there was a technical insufficiency or deficiency if the observation of one of the actions of resuscitation of the newborn is not performed correctly.

Data were collected from the survey sheet and analyzed with the Statistical Package for Social Sciences (SPSS) software version 25. A descriptive analysis was performed to determine the frequency of categorical variables.

As with any research activity, there is an ethical problem, especially in health. We have sought permission from both the department head and parents. Anonymity and confidentiality of data have been preserved.

### 3. Results

During the study period, out of a total of 811 live births, 200 newborns were resuscitated, with a 24.66% frequency of neonatal resuscitation. The data obtained on the parturient and pregnancy were. For the parturient woman, she had an average age of  $27.45 \pm 0.686$  years, the vast majority or 87.5% of cases was between 18 and 35 years with extremes [15 - 45 years] with 6% of teenage mothers. More than half (57% of cases) were not in school and 88.5% were housewives. For pregnancy, the vast majority (86.5% of cases), follow-up was carried out at the RHC of the District V. It was insured by a midwife in 79% of the cases followed by gynecologists in 21%. A significant number of parturients, 71%, had less than four prenatal consultations (PNC). Hypertension was the most associated pathology in 6.5% of cases. Pregnancies were too close together in 15% of cases (one year) (Table 1).

The data obtained on delivery and the newborn are as follows. Evacuations

represented 15% of the admission mode. The delivery by cesarean section accounted for 34% of the mode of delivery. Close to the point where all newborns (93% of cases) were born at term with a gestational age between 37 and 41 weeks. The average gestational age was 37.6 Weeks of Amenorrhea (WA)  $\pm$  2.3 with extremes of [32 and 45 WA]. The sex ratio was 1.2 in favor of the male. The average weight was 2710.32 g  $\pm$  68.43 with extremes [2008 g and 4100 g]. Nearly all newborns (94% of cases) had a normal birth weight (2500 - 4000 g), a normal height in 98.5% of cases and a normal cranial circumference in 80.5% (**Table 2**).

Data-t-on the assessment of neonatal resuscitation included the preparation of resuscitation equipment. We observed that the resuscitation table was lit (99% of cases) before each birth but the linens were not preheated in 99.5% of the cases. The functionality of the vacuum was only verified in 51.5% of cases, the balloon with mask was to be carried by hands in 47% of cases. There were at least two people to provide resuscitation before each birth (100% of cases). More than half, or 56.5%, did not wash their hands before wearing gloves. All staff had received neonatal resuscitation training (**Table 3**).

On the reception of the newborn, it was ensured by a midwife in 90% of cases and she was all trained (100% of cases) on emergency care of the newborn in the delivery room. All newborns were well-dried (98.5%) with wet linen change only in 49.5% of the cases. In 7.5% of the cases, the newborns were in a state of apparent death (the Apgar score was less than 3). There was a need for resuscitation due to lack of crying in 78.5% and or heart rate <100 beats/min or absence of heart beat in 16% of newborns (**Table 4**).

The data obtained on the evaluation of the stages, techniques and success achieved in each stage were as follows. For the first stage of resuscitation, hypothermia was correctly prevented in only 49.5%. The stimulation practice was correctly done (99.5%), as well as the airway release (95%). Nearly half or 49% of newborns had recovered at the end of the first stage of resuscitation (**Table 5**).

Regarding the second stage ventilation mask, the mask was correctly arranged only 91.2%. The head and shoulder were correctly positioned in only 61.8% of cases. At each insufflation the thorax was raised in 81.2% with a normal rate (30 to 40 per minute) than in 67.6%. Of the 102 neonates, 65 had recovered (63.7% success rate) (**Table 6**).

The third stage including cardiac massage associated with ventilation mask was performed in 37 newborns; the technique was correctly performed in 81% and the rhythm was adapted only in 27/37 newborns or 73%. By the end of the third stage, 30 out of 37 newborns had recovered or 81% success. The Apgar score evaluated in the fifth minute was between 7 and 10 in 95.5% of newborns. It remained below 3 in 3.5%. At no time during resuscitation, the temperature was controlled. For the fate of newborns after resuscitation, resuscitation was stopped in 7 newborns (declared dead) and 42 newborns were transferred to neonatology, the main reason for the transfer was respiratory distress in 85% (36 newborns) and the others stayed with their mothers at the maternity hospital (**Table 7**).

**Table 1.** Distribution of newborns by information on the parturient and pregnancy.

Information on the parturient and pregnancy	Effective n = 200	%	IC
Age (year)			
< 18	12	6	
<b>18 - 35</b>	<b>175</b>	<b>87.5</b>	<b>[15 - 45]</b>
36 - 45	13	6.5	
<b>Level of education</b>			
Primary	4	2	
Secondary	43	21.5	[16 - 27]
Higher	39	19.5	[14 - 25]
<b>Non-educated</b>	<b>114</b>	<b>57</b>	<b>[50.5 - 63.5]</b>
<b>Matrimonial status</b>			
<b>Married</b>	<b>177</b>	<b>88.7</b>	<b>[26 - 28]</b>
Celibate	23	11.5	
<b>Place of pregnancy follow-up</b>			
<b>RHC district V</b>	<b>173</b>	<b>86.5</b>	<b>[25 - 27]</b>
Community health center	18	9	[12 - 24]
Private clinics/practices	9	4.5	[18 - 26]
<b>Health Officer doing antenatal consultation</b>			
<b>Midwife</b>	<b>158</b>	<b>79</b>	<b>[25.7 - 29.4]</b>
Gynecologist	42	21	[26 - 27]
<b>Numbers of antenatal consultation</b>			
< 4	58	29	
<b>≥ 4</b>	<b>142</b>	<b>71</b>	<b>[3.7 - 4]</b>
<b>Pathology associated with pregnancy</b>			
<b>Arterial hypertension</b>	<b>13</b>	<b>6.5</b>	<b>[1.1 - 3.6]</b>
Diabetes	8	4	[1.8 - 3.3]
Sickle cell disease	2	1	[-9.7 - 15.7]
HIV	1	0.5	
<b>Interreproductive interval (year)</b>			
< 1	<b>30</b>	<b>15</b>	<b>[1.5 - 1.9]</b>
1 - 2	91	45.5	
≥3	79	39.5	

**Table 2.** Distribution of newborns according to the data obtained on delivery and the newborn.

Evidence from childbirth and the newborn	Effective n = 200	%	IC
Mode of admission			
Direct	170	85	[79.4 - 89.4]
<b>Evacuation</b>	<b>30</b>	<b>15</b>	
<b>Route of delivery</b>			
Vaginal route	132	66	[59 - 72.5]
<b>Caesarian</b>	<b>68</b>	<b>34</b>	<b>[27.5 - 41]</b>
<b>Birth term (Week of the Amenorrhoea)</b>			
< 37	6	3	
<b>37 - 41</b>	<b>186</b>	<b>93</b>	<b>[56.3 - 70.4]</b>
> 41	8	4	
<b>Sex</b>			

Continued

Male	108	54	
Female	92	46	
<b>Birth weight (g)</b>			
< 2500	8	4	
<b>2500 - 4000</b>	<b>188</b>	<b>94</b>	<b>[41.5 - 97.8]</b>
>4000	4	2	
<b>Birth length (cm)</b>			
<46	2	1	
<b>46 - 50</b>	<b>197</b>	<b>98.5</b>	<b>[72.3 - 124.3]</b>
>50	1	0.5	
<b>Cranial perimeter (cm)</b>			
<32	33	16.5	
<b>32 - 35</b>	<b>161</b>	<b>80.5</b>	<b>[60.4 - 101.4]</b>
>35	6	3	

**Table 3.** Distribution of newborns based on evaluation of material preparation.

Evaluation of material preparation	Effective n = 200	%	IC
<b>Material preparation</b>			
<b>Resuscitation unit</b>			
Lit	198	99	[97.5 - 100]
Unlit	2	1	
<b>Preheated Linens</b>			
Yes	1	0.5	
No	199	99.5	[98.5 - 100]
<b>Room without drafts and temperature &gt; 26°C</b>			
Yes	200	100	
<b>Available oxygen</b>			
Yes	200	100	
<b>Check the vacuum</b>			
Made	103	51.5	[44.5 - 59]
Not made	97	48.5	[41 - 55.5]
<b>Balloon + mask to wear hands</b>			
Yes	94	47	[40.5 - 37.5]
No	106	53	[62.5 - 75]
<b>Number of resuscitation agents</b>			
1			
2	200	100	
<b>Hand washing</b>			
Made	87	43.5	[36.5 - 50.5]
Not made	113	56.5	[49.5 - 63.5]
<b>Wearing of gloves</b>			
Yes	200	100	

**Table 4.** Distribution of newborns according to the assessment of the newborn's reception.

Evaluation of the actual reception of the newborn	Effective n = 200	%	IC
<b>Responsible health officer</b>			

Continued

Midwife	180	90	[78.5 - 102.5]
Doctor	20	10	
<b>Is the officer trained</b>			
Yes	200	100	
No	0	0	
<b>Immediate drying</b>			
Made	197	98.5	
Not made	3	1.5	
<b>Wet linen change</b>			
Yes	99	49.5	[42.5 - 56.5]
No	101	50.5	[43.5 - 57.5]
<b>Apgar score in the first minute</b>			
< 3	15	7.5	
3 - 6	185	92.5	[96.5 - 100]
<b>Need resuscitation for</b>			
No cry	157	78.5	[72.5 - 84.5]
<b>Heart rate &lt; 100 and or absent</b>	32	16	
Irregular or absent breathing	7	3.5	
Paleness or cyanosis	4	2	

**Table 5.** Distribution of newborns according to stage assessment data, techniques and success in the first stage of resuscitation.

Evaluation of the first stage of the resuscitation	Effective n = 200	%	IC
<b>Correct prevention of hypothermia</b>			
Yes	99	49.5	[42.5 - 56.5]
No	101	50.5	[43.5 - 57.5]
<b>Tactile stimulation correctly performed</b>			
Yes	199	99.5	[98.5 - 100]
No	1	0.5	
<b>Correct airway clearance</b>			
Yes	190	95	[92.5 - 98]
No	10	5	
<b>Recovery at the end of this step</b>			
Yes	98	49	[42 - 55.5]
No	102	51	[44.5 - 58.5]

**Table 6.** Distribution of newborns according to assessment data, stages, techniques and success in stage two of resuscitation.

Evaluation of the second stage of the Resuscitation (Mask ventilation)	Effective n = 102	%	IC
<b>Mask correctly placed</b>			
Yes	93	91.2	[40.5 - 54]
No	9	8.8	
<b>Correct head and shoulder position</b>			
Yes	63	61.8	[25 - 37.5]
No	39	38.2	
<b>Thorax lifts at insufflation</b>			

Continued

Yes	83	81.2	[35 - 48]
No	19	18.8	
<b>Correct insufflation frequency</b>			
Yes	69	67.6	[28 - 41]
No	33	32.4	
<b>Recovery at the end of this step</b>			
Yes	65	63.7	[27.5 - 38.5]
No	37	36.3	

**Table 7.** Distribution of newborns according to the data obtained on stage assessment, techniques and success in stage three of resuscitation and their immediate becoming.

Evaluation of the third stage (Ventilation with mask associated with external cardiac massage) and their becoming immediate	Effective n = 37	%	IC
<b>Correct technique of Mask Ventilation (MV)</b>			
Yes	30	81.1	[48.5 - 62.4]
No	7	18.9	
<b>Correct technique of the Massage External Cardiac (MEC)</b>			
Yes	30	81.1	[79.7 - 89.1]
No	7	18.9	
<b>Technique correcte de MV et MEC</b>			
Yes	27	73	[82.7 - 91.6]
No	10	27	
<b>Oxygen was used</b>			
Yes	37	100	
<b>Recovery at the end of this step</b>			
Yes	30	81.1	[5.9 - 14.4]
No	7	18.9	
<b>Apgar 5th minute</b>			
1 - 3	7	3.5	
4 - 6	2	1	
7 - 10	191	95.5	[92 - 97.5]
<b>Become immediate (n = 200)</b>			
Failure to resuscitate	7	3.5	
Newborn stays at maternity	151	75.5	[66.5 - 79.5]
<b>Transfer to neonatology for cause</b>			
<b>Respiratory distress (n = 42)</b>			
Macrosomia	4	9	[7 - 35.5]
Fetal hypotrophy	2	4	

#### 4. Comments and Discussion

**Study Limitations:** We conducted a cross-sectional study to describe the situation at a given time and in a given location. Despite these limitations, our results shed more light on the practice of neonatal resuscitation in the delivery room that requires urgent intervention.

##### The proportion of newborn resuscitated

During our study on 811 births, 200 newborns were reanimated, a proportion

of 24.66%. This rate is higher than that of Kinda B. at the CHU-YO in Ouagadougou, with 6.55% [17]. This could explain that we are at the second level of the health pyramid in Mali. We receive patients in labor of delivery from other health structures (private structures and community health centers).

#### **Data-t-on pregnancy and childbirth**

The effectiveness of pregnancy monitoring is judged by its initiation, a first consultation before the third month of pregnancy, its regularity, the number of at least four prenatal visits with the purpose of screening for pregnancies at risk and planning for delivery [15] [18]. In our study, we found that one in three pregnancies were poorly followed (29% of the cases). Although we observed a slight improvement with a slight increase in the proportion of Malian women who had at least four antenatal visits from 30% in 2001 to 43% in 2018 [18]. Referrals or evacuations can increase the risk of perinatal asphyxia [19] [20]. The decision to refer or evacuate a parturient woman is taken in situations of complications of labor or due to susceptibility to having one. And these are added to the time and condition of transport of this [15] [19] [20]. In our series, we observed that in 15% of newborns reanimated at birth, the mothers were referred or evacuated by another health system. The same observation was made by Diallo A *et al.* in Guinea who found that a parturient referred or evacuated to 5 times of risk that her newborn presents an Acute Fetal Suffering at birth and Belinga *et al.* in Yaound , found a risk increase of 38% [19] [20].

#### **State of preparations for resuscitation**

According to international recommendations, resuscitation of a newborn requires preparation, anticipation, teamwork and coordination. Equipment must always be operational and checked before each intervention [21]. We found some deficiencies in the resuscitation preparation, such as checking the functionality of the vacuum (51.5%), the balloon with a mask was to be worn by hands only in 47% of cases and a little more than half (56.5%) Wore gloves without hand washing. Whereas the success of a resuscitation depends on anticipation.

#### **Evaluation of neonatal resuscitation practice**

The stages of resuscitation carried out in our study were: welcoming the newborn into a clean, dry and heated cloth, drying it quickly, wrapping it in another cloth. Then proceed to deostruction if necessary, tactile stimulation (the first stage or phase A of ILCOR), Balloon ventilation (the second stage or phase B of ILCOR) and balloon ventilation associated with external cardiac massage (the three stage or phase C of ILCOR). However, we did not intubate or administer adrenaline or other products or drugs [16] [21].

Regarding the execution of the first stage of resuscitation, hypothermia was correctly prevented in only 49.5% by lack of change of wet linen. So our newborns lose heat by conduction which is one of the four mechanisms responsible for the loss of heat in a newborn. Normothermia is essential to effective resuscitation and the latest recommendations have emphasized this [21]. In the implementation of the second (ventilation with mask) and third (ventilation with mask associated to

external cardiac massage) steps, we observed technical inadequacies in 38.2% and 27% of cases respectively. The same observation was made in studies carried out in our regions on the practice of resuscitation of the newborn as in Cameroon, Togo, Nigeria and Ethiopia [22]-[25].

In our study, the first stage of ILCOR phase A was successful in neonatal resuscitation, which allowed for almost half (49%) of newborns to be recovered. Applying the first two steps 1 and 2 allowed recovery of 32.5% of newborns (phase B) and the third step was necessary to recover 15% of newborns (Phase C). Failure of resuscitation was found in 3.5% of cases. These results are superimposed to those of Diakité M *et al* at the maternity hospital of the Gabriel Touré University Hospital in Bamako, whose first stage allowed recovery of 63.6% of newborns and that resuscitation continued until phase B and C in 21 respectively, 5% and 8.4%. Failure of resuscitation was observed in 1.6% of cases [26]. By applying the three phases A, B, C of neonatal resuscitation we obtained a success rate of 95.5%. While Diallo A *et al.* in Guinea found a 90% rate with phase A (aspiration, tactile stimulation) and phase B (ventilation with mask and balloon) [20]. The correct application of neonatal resuscitation steps can save a significant number of newborns in the delivery room, despite the limitations of our technical plateau.

#### **Become immediate for reanimated newborns**

After neonatal resuscitation, 42 newborns were transferred to neonatology, including 36 newborns in a respiratory distress table [20]. Neonatal mortality in our study was 3.5% (7 neonates died) is superimposed to that (3.5%) reported by Diallo A *et al.* in Guinea [20] and slightly lower than the (4.93%) reported by Munan *et al.* in Lubumbashi [27].

## **5. Conclusion**

The proportion of resuscitated newborns is high at the maternity ward of the Reference Health Center (RHC) of District V. We observed a resuscitation rate of 24.66%. Most steps were correctly applied, although some improvements are needed in areas such as hypothermia prevention and equipment preparation. Nearly half of the newborns (49%) had recovered at the end of the first stage of resuscitation. In the second stage application, 32.5% of newborns recovered and 15% of newborns recovered in the third stage. Overall, the success rate was 95.5% despite the very limited technical plateau.

## **Conflicts of Interest**

The authors declare no conflicts of interest regarding the publication of this paper.

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