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Prevention of sudden unexpected postnatal collapse (SUPC) of a newborn in relation to skin-to skin-contact

Zapobieganie wystąpieniu nagłej, niespodziewanej zapaści poporodowej u noworodka (SUPC) w odniesieniu do kontaktu „skóra do skóry"

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A – Development of the concept and methodology of the study/Opracowanie koncepcji i metodologii badań; B – Query - a review and analysis of the literature/Kwerenda – przegląd i analiza literatury przedmiotu; C – Submission of the application to the appropriate Bioethics Committee/Złożenie wniosku do właściwej Komisji Biotycznej; D – Collection of research material/Gromadzenie materiału badawczego; E – Analysis of the research material/Analiza materiału badawczego; F – Preparation of draft version of manuscript/Przygotowanie roboczej wersji artykułu; G – Critical analysis of manuscript draft version/Analiza krytyczna roboczej wersji artykułu; H – Statistical analysis of the research material/Analiza statystyczna materiału badawczego; I – Interpretation of the performed statistical analysis/Interpretacja dokonanej analizy statystycznej; K – Technical preparation of manuscript in accordance with the journal regulations/Opracowanie techniczne artykułu zgodne z regulaminem czasopisma; L – Supervision of the research and preparation of the manuscript/Nadzór nad przebiegiem badań i przygotowaniem artykułu

STRESZCZENIE

ZAPOBIEGANIE WYSTĄPIENIU NAGŁEJ, NIESPODZIEWANEJ ZAPAŚCI POPORODOWEJ U NOWORODKA (SUPC) W ODNIESIENIU DO KONTAKTU „SKÓRA DO SKÓRY"

Cel pracy. Celem niniejszego badania było dokonanie zakresowego przeglądu istniejącej literatury naukowej na temat bezpiecznego stosowania kontaktu „skóra do skóry" u noworodków na sali porodowej, z naciskiem na zachowania mające na celu zwiększenie bezpieczeństwa noworodków.

Materiał i metody. Przeprowadzono zakresowy przegląd literatury zgodnie z wytycznymi PRISMA-ScR. Przegląd polegał na wyszukaniu artykułów naukowych opublikowanych w latach 2011-2022 w naukowych bazach danych, takich jak ScienceDirect, Web of Science oraz PubMed.

Wyniki. Z początkowej puli 1011 artykułów wyłoniono artykuły istotne dla tematu pracy i aktualne. Analiza pozwoliła na wyłonienie czterech obszarów tematycznych: wiedza i biegłość personelu pielęgniarskiego na sali porodowej; wykorzystanie narzędzi oceny i strategii nadzoru; aspekty organizacyjne sal porodowych; edukacja matek i aktywne uczestnictwo.

Wnioski. Aby zapobiec przypadkom SUPC, kluczowe znaczenie ma holistyczne podejście obejmujące zarówno monitorowanie kliniczne, jak i mechaniczne, kładące nacisk na edukację matek i wsparcie ze strony wykwalifikowanego personelu pielęgniarskiego.

Słowa kluczowe: noworodek, opieka „skóra do skóry", nagła, niespodziewana zapaść poporodowa, położne, pielęgniarki neonatologiczne

ABSTRACT

PREVENTION OF SUDDEN UNEXPECTED POSTNATAL COLLAPSE (SUPC) OF A NEWBORN IN RELATION TO SKIN-TO SKIN-CONTACT

Aim. This study aimed to scoping review the existing literature on the Safe Utilization of Skin-to-Skin Contact (SSC) for neonates in the delivery room, focusing on interventions to enhance newborn safety and to prevent sudden unexpected postnatal collapse (SUPC).

Material and methods. A comprehensive scoping review in line with PRISMA-ScR guidelines was conducted, by searching for scholarly articles published between 2011 and 2022 in scientific databases like ScienceDirect, Web of Science, and PubMed.

Results. From an initial pool of 1,011 articles, relevant and topical ones were identified and categorized into four thematic areas: Knowledge and Proficiency of Delivery Room Nursing Staff; Use of Assessment Tools and Surveillance Strategies; Organizational Aspects of Delivery Rooms; Maternal Education and Active Participation.

Conclusions. To prevent SUPC-related issues, a holistic approach involving both clinical and mechanical monitoring is crucial, emphasizing maternal education and support from skilled nursing staff.

Key words: newborn, skin-to-skin care, sudden unexpected postnatal collapse, midwives, neonatal nurses

INTRODUCTION

In neonatology, the phenomenon of Sudden Unanticipated Postnatal Collapse (SUPC) is characterized as an abrupt cardiopulmonary decompensation in an otherwise healthy newborn, devoid of antenatal and perinatal risk factors, typically occurring within the first week of life [1]. This condition pertains to a neonate who, in the fifth minute following birth, achieves an Apgar score of 8 or higher and yet experiences an unforeseen onset of apnea, often necessitating resuscitative measures. Notably, Matzner [2] and Filipi [3] underscore that this distressing event predominantly unfolds within the initial 2 to 3 hours postnatally, particularly during the crucial phase of skin-to-skin contact (SSC). Fendrychová [4] further accentuates the significance of monitoring risk factors on both the maternal and neonatal fronts, underscoring the responsibility of the nursing staff in this context. AWHONN [5] unequivocally recommends the continuous surveillance of all cardiorespiratory-stable neonates during the first two hours following birth while engaged in SSC and breastfeeding, advocating for the supervision to be conducted by proficient healthcare personnel. Ludington and Morgan [6] extend these monitoring protocols by suggesting the utilization of the RAPPT scoring scale, which integrates Apgar score criteria and, distinctively, evaluates the positional dynamics of the infant during SSC, thereby enhancing the precision of assessments.

AIM

The principal aim of this scoping review was to systematically identify, analyse, and succinctly summarize the corpus of existing knowledge concerning Sudden Unanticipated Postnatal Collapse (SUPC) within the context of Skin-to-Skin Contact (SSC) practices within the delivery room. Concomitantly, a sub-objective was to pinpoint and elucidate the interventions aimed at augmenting the safety of newborn infants immediately following birth in the delivery room. The specific research question that guided this endeavour is formulated as follows: „What are the interventions that contribute to enhancing the safety of neonates in the immediate postnatal period within the delivery room?".

METHODS

This scoping review was executed in strict accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) guidelines [7], as illustrated in Figure 1. The comprehensive search for relevant articles transpired in the latter half of the year 2022, encompassing publications from the period spanning from 2011 to 2022. The resulting analyzed studies were from the years 2018-2022, as no scientific outputs related to the monitored topic were identified in the years 2011-2017. To curate our sources, we meticulously scoured renowned scientific databases, including ScienceDirect, Web of Science, and PubMed. In this pursuit, we employed a systematic set of Medical Subject Headings [MeSH] terms, specifically „Sudden Unexpected Postnatal Collapse" AND „Skin-to-Skin" OR „Golden Hour" OR „Kangaroo Mother Care" AND „Newborn". Furthermore, we collaborated with a specialist from the Academic Library at the University of South Bohemia in České Budějovice to fine-tune and optimize our chosen keywords.

Tab. 1. The criteria for resource selection

Inclusion criteria	Exclusion criteria
• articles published in English • articles published during 2011-2022 • quantitative studies • a revised full text available	• all kinds of reviews and qualitative studies • grey-literature • non-English articles • conference proceeds

Extraction, synthesis, and critical evaluation of data

To perform the analyses of articles retrieved from the scientific databases, a comprehensive 3-step method, as recommended by Červený, Siaki, Prosen, and Nagórská [8] was employed. This method was systematically executed within MS Excel. In the initial step, the titles and abstracts of the selected articles were rigorously examined. In the second step, these articles were meticulously scrutinized and categorized in accordance with predetermined inclusion criteria (as detailed in Table 1). The relevancy of the chosen articles was assessed by two independent reviewers, aligning their evaluations with the clearly defined research question. In assessing the quality of the selected articles, the Mixed Methods Appraisal Tool (MMAT) in its 2018 version was employed. This tool facilitated the rigorous evaluation of the methodological quality of studies, encompassing qualitative, quantitative, and mixed methods research. It is structured into three distinct categories, each with unique methodological criteria, and each criterion was rated as either „Yes," „No," or „Cannot tell," following the guidelines established by Hong et al. [9]. In the final step, data extraction was performed and a synthesis of the extracted information carried out. Notably, articles included in this scoping review underwent a secondary analysis one week after the initial review to mitigate the risk of potential misinterpretations or erroneous conclusions.

The extracted data were systematically organized, coded, and categorized into four thematic domains:

1. Knowledge and Proficiency of Delivery Room Nursing Staff;
2. Use of Assessment Tools and Surveillance Strategies;
3. Organizational Aspects of Delivery Rooms;
4. Maternal Education and Active Participation.

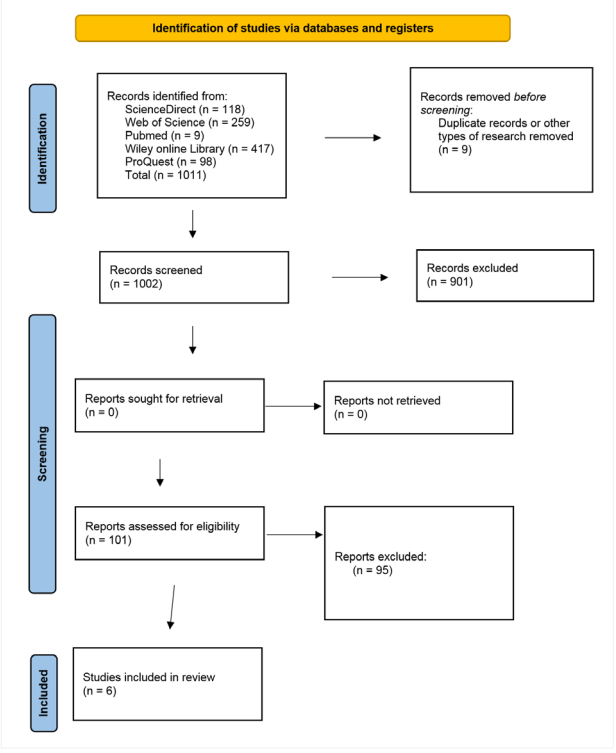

Fig 1. PRISMA-ScR chart vyhledávání relevantních publikací – PRISMA-ScR

Characteristics of articles

The selected articles under scrutiny were published within the timeframe spanning from 2018 to 2021, and they emanated from diverse geographical locations, including the United States [2,10,11,12], Italy [13,14] and Australia [15].

All the studies included in this review adhered to a quantitative research paradigm. Specifically, five of them utilized a question-based approach, employing questionnaires as their primary data collection tool [2,10,12,13,15]. Notably, in four of these cases, the questionnaires were administered via email as the chosen mode of data collection. Additionally, one study adopted a prospective observational methodology [14] and another employed direct observational techniques [11]. The research set within the reviewed studies can be categorized into four distinct groups:

1. Middle Management of Maternity Wards: Barbaglia et al. [13] focused on 28 chief doctors and matrons from the department responsible for the care of newborns and postpartum mothers. Matzner et al. [2] engaged with 39 hospital managers overseeing obstetric and postpartum care.
2. Nursing Staff of Maternity Wards: Addison et al. [10] involved 36 midwives, while Du Plessis et al. [15] enlisted 40 midwives, and Paul et al. [12] interacted with 48 midwives. Ludington Hoe et al. [11] specifically engaged 17 paediatric nurses.
3. Mothers After Birth: Du Plessis et al. [15]) conducted research involving 50 mothers, and Paul et al. [12] interacted with a cohort of 83 mothers.
4. Physiological Newborns: Lavizzari et al. [14] incorporated a sample of 60 physiological newborns into their study.

Topic 1: Knowledge and Proficiency of Delivery Room Nursing Staff

In the study led by Addison and Ludington-Hoe [10], the focus was aimed on assessing the knowledge of midwives regarding Sudden Unanticipated Postnatal Collapse (SUPC) and the safe positioning of newborns during Skin-to-Skin Contact (SSC) immediately after birth in delivery rooms. Questions pertaining to SUPC were formulated based on existing scientific literature, while queries regarding positioning were guided by the SSC Checklist, as developed by Ludington-Hoe and Morgan [11]. The findings from this research revealed that the respondents exhibited a more comprehensive understanding of safe positioning practices in comparison to their knowledge about SUPC. It is important to note that the study's results were somewhat constrained by the relatively small number of respondents. Nevertheless, the authors advocate for a concentrated effort to enhance the education of nursing staff in maternity wards, focusing on the prevention of SUPC throughout the entirety of a newborn's hospital stay. Additionally, the authors emphasize the significance of educating about the potential risks associated with SUPC not only mothers during the postnatal period but both parents.

In the research conducted by Paul et al. [12], anonymous questionnaires were distributed to nursing staff responsible for the care of newborns in the delivery room. This survey involved the participation of 48 midwives. Notably, 58% of the responding midwives considered continuous pulse oximetry (CPOM) as a pivotal preventive measure against SUPC during SSC in the delivery room. Simultaneously, a considerable portion, also at 58%, expressed the belief that the utilization of this intervention might divert their attention from other essential duties. Furthermore, 50% of the participants in this study held the perspective that CPOM did not disrupt the bonding or breastfeeding process of the newborn in the delivery room.

Topic 2: Use of Assessment Tools and Surveillance Strategies

In the study by Du Plessis et al. [15], the investigation centred around the feasibility of employing continuous pulse oximetry (CPOM) for newborns immediately after birth as a non-invasive standard care approach to ensure secure Skin-to-Skin Contact (SSC). Following the implementation of this approach, midwives and postpartum mothers were interviewed to gauge their satisfaction with the new practice. Prior to introducing this innovative nursing standard, the healthcare staff underwent comprehensive professional training. The results of the study revealed that the majority of midwives embraced the incorporation of CPOM into practice positively, citing the heightened safety it afforded to newborns. The project conducted by Ludington-Hoe et al. [11] aimed to test the novel RAPPT (Respiratory, Activity, Position, Perfusion, Tone) scoring system for newborns in clinical practice. This project unfolded in three distinct phases. In the initial phase, one of the authors observed deliveries and the initial two hours of infant care for a cumulative total of 240 hours,

with the objective of assessing the specific needs of the mother-newborn dyad. The observations underscored inaccuracies in the Apgar scoring system. Importantly, RAPPT was not systematically utilized by the nursing staff. In the second phase, an educational intervention for nurses was conducted, and knowledge levels were assessed before and after the education. The third phase focused on evaluating the ensuing changes in clinical practice. The results highlighted the successful adoption and accurate utilization of the RAPPT scoring system within the department. It is important to acknowledge that the study was limited by a relatively small sample size. Paul et al. [12] described the implementation of a comprehensive intervention designed to eliminate instances of Sudden Unanticipated Postnatal Collapse (SUPC) within the delivery room during Skin-to-Skin Contact (SSC). The intervention included several components, such as the utilization of CPOM with the Massimo device and the application of the RAPPT method. Nurses assessed RAPPT scores at 15-minute intervals during the first hour post-birth and subsequently at 30-minute intervals. Results indicated that before the implementation of the complex intervention, there were five cases of SUPC, whereas after its introduction, no such cases were reported.

Lavizzari et al. [14] set out to assess the degree of heart rate synchronization between the novel ComTech HOWDY devices (a textile jacket for newborns with integrated sensors detecting EKG signals and Bluetooth PC connectivity) and conventional EKG monitoring during SSC in the initial two hours following birth, with a focus on early SUPC detection. The research cohort comprised 60 physiological newborns. Findings illuminated that the ComTech HOWDY devices exhibited reliable synchronization with EKG data, rendering them suitable for SUPC prevention through accurate, comfortable, and minimally invasive monitoring. The authors recommended expanding the capabilities of the device to include the monitoring of respiratory rate and body temperature via continuous pulse oximetry (CPOM).

Topic 3: Organizational Aspects of Delivery Rooms

Matzner et al. [2] conducted a study involving 39 selected hospitals in the United States, with a focus on the nursing care of physiological newborns. The research aimed to evaluate the implementation of recommended procedures for mother and infant care post-birth, as outlined by The American Academy of Paediatrics (AAP). The objective was to assess the adherence to individual components that contribute to the prevention of Sudden Unanticipated Postnatal Collapse (SUPC) during Skin-to-Skin Contact (SSC). The study's findings indicated that most hospitals generally adhered to principles related to the observation and monitoring of the mother-newborn dyad, the sequence of nursing care, and the practice of SSC after birth. Notably, hospitals with a larger bed capacity and a higher volume of newborns tended to perform better in terms of adhering to AAP guidelines. The authors recommend an emphasis on standardizing nursing procedures for infant care during SSC. Barbalgia et al. [13] conducted a two-phase research study in 2012 and 2016. In this longitudinal assessment, chief doctors in maternity wards, in collaboration with head midwives, responded to inquiries across three key domains: early Skin-to-Skin Contact (SSC), the organization of medical and nursing staff within maternity wards, and the equipment and facilities available in the delivery and postpartum rooms. The study did not uncover any significant alterations between the two time points, indicating that certain appropriate nursing procedures had already been established in 2012, and potential improvements were not statistically significant. In light of these findings, the authors advocate for a concentrated effort to implement interventions aimed at the prevention of SUPC. These interventions include the establishment of standardized protocols for safe SSC, ensuring well-illuminated environments for continuous clinical monitoring, employing instrumental monitoring to identify high-risk situations, optimizing the positioning of both the mother and the newborn, and mitigating potential distractions for the mother during SSC.

Topic 4: Maternal Education and Active Participation

In the research conducted by Du Plessis et al. [15], the primary focus was on the introduction of continuous pulse oximetry (CPOM) for newborns immediately after birth, targeting both nursing staff and mothers. The study was structured in two distinct phases. In the initial phase, mothers were provided with a questionnaire without prior educational intervention. The findings revealed that, after the introduction of CPOM, half of the surveyed mothers reported feeling increased reassurance when their newborns were connected to CPOM, with the same proportion asserting that CPOM did not have a detrimental impact on the bonding process. Alarmingly, only 18% of the interviewed mothers were cognizant of the risks associated with Sudden Unanticipated Postnatal Collapse (SUPC). The second phase involved the distribution of an educational brochure to mothers, with a specific focus on SUPC and CPOM. As a result, awareness among mothers increased by over 50%, and 83% of those surveyed indicated heightened security when their newborns were connected to the monitoring system. The authors recommend the integration of maternal education during the prenatal period, underscored by the importance of research in the field of wireless technologies for monitoring. As part of their broader study centred on the development of a comprehensive care package aimed at preventing Sudden Unanticipated Postnatal Collapse (SUPC), Paul et al. [12] distributed questionnaires to mothers during their hospitalization following delivery. These inquiries specifically addressed the newly introduced CPOM method and its potential impact on the bonding process. Encouragingly, a substantial 85% of the interviewed mothers believed that CPOM did not disrupt the bonding process after delivery and reported feeling more secure in this context.

DISCUSSION

The period during and immediately after delivery represents a critical phase in a newborn's life, marked by significant physiological adjustments, including the stabilization of the respiratory and cardiovascular systems. A nurse's role in this context is to provide continuous clinical assessment of the newborn's postnatal adaptation to its transition into an external environment [16]. Contemporary trends in mother and newborn nursing care in delivery rooms emphasize the immediate initiation of fully operational Skin-to-Skin Contact (SSC) following birth, replacing the traditional practice of separating the newborn from the mother for treatment before breastfeeding. This shift underscores the paramount importance of bonding and attachment for both the mother and child, making SSC the best practice adopted in delivery rooms worldwide [17]. As a result, there is a growing emphasis on educating healthcare staff about the significance of bonding [18]. However, it is important to acknowledge that SSC practices are not universally implemented in all delivery rooms, potentially due to concerns about Sudden Unanticipated Postnatal Collapse (SUPC), a severe albeit infrequent complication that can occur during bonding. Roncati and Piscioli [17] emphasize the necessity of continuous monitoring during SSC to mitigate SUPC risks. The analysis of research results highlights the critical role played by the nursing staff in delivering infant care in the delivery room, especially in the context of preventing SUPC (Topic: Knowledge and Proficiency of Delivery Room Nursing Staff). Adequate knowledge of providing SSC and monitoring the newborn's adaptation during the first two hours post-delivery is paramount [10]. The study by Paul et al. [12] revealed that more than half of the surveyed nurses found instrumental monitoring beneficial and non-disruptive to the bonding process. Minimizing risk factors and implementing protective measures, particularly during the first hours of life, can reduce harm to the newborn, alleviate parental psychological distress, and prevent further instances of SUPC [19]. Instrumental monitoring, including the use of continuous pulse oximetry (CPOM), was examined by Du Plessis et al. [15] and received positive feedback from most respondents. Chen et al. [19] also found transcutaneous monitoring devices to be significantly helpful in SUPC prevention. The study by Lavizzari et al. [14] explored the potential introduction of a novel monitoring method in the form of ComTech HOWDY, a textile jacket for newborns that provides functionality comparable to conventional EKG monitoring. It offers comfort for both the newborn and the mother while minimally interfering with SSC. However, it is essential to recognize that even the most advanced monitoring devices cannot fully replace clinical observation carried out by the nursing staff [5]. AWHONN [5] recommends the continuous presence of a nurse by the hospital bed during the initial two hours of newborn adaptation. Frequent check-ups by a nurse enable the rapid identification of risk factors and allow for the prompt implementation of safety measures [20]. For the evaluation of a newborn's adaptation during SSC, the Apgar score is often employed [21]. However, it is important to note that the Apgar score was originally designed for assessing newborns in heated beds, not during SSC. The research conducted by Ludington-Hoe et al. [11] revealed incorrect Apgar score ratings by nursing staff during SSC, prompting an educational intervention to instruct midwives on the use of the newly developed RAPPT scale. This scale was subsequently integrated into regular practice within the department. The combination of instrumental monitoring via CPOM and clinical observation based on the RAPPT method was investigated by Paul et al. [12]. The results demonstrated positive evaluations by nursing staff and a reduction in the incidence of SUPC following the introduction of this comprehensive intervention. The technological advancement in newborn care in the delivery room must consider the unique environment, individual patient needs, and the human factor [22]. Another crucial factor in ensuring the safety of both the mother and newborn is the management of postpartum care in healthcare facilities (Topic: Organizational Aspects of Delivery Rooms). Matzner et al. [2] specifically examined the adherence to standard procedures for newborn and mother care in terms of safe SSC and SUPC prevention, following the guidelines of The American Academy of Pediatrics (AAP). These guidelines recommend early and secure SSC post-delivery and rooming-in for subsequent care [23]. An intriguing discovery was the higher rate of adherence to recommendations in most hospitals. Smaller hospitals may have greater flexibility for individualized care due to their lower delivery volumes. Herlenius and Kuhn [24] underscore the importance of conducting audits to prevent deviations in practice by delivery room personnel. Feldman-Winter et al. [23] also emphasize the significance of adequate staffing in delivery rooms. The study by Barbalgia et al. [13] primarily focused on newborn safety and maternal education in SUPC prevention. It highlighted the importance of continuous clinical or instrumental monitoring, the availability of signalling devices, the provision of adequate lighting for clinical observations of the newborn, and the accessibility of resuscitation emergency carts. The World Health Organization (WHO) has proposed a „WHO Checklist for Safe Delivery" as a tool to enhance the quality of care provided to women and newborns during childbirth. However, the objectives of the WHO Checklist can only be realized through its active implementation in delivery room practices. Education for mothers during childbirth and their support is pivotal for newborn safety in the delivery room [25]. Du Plessis et al. [15] assessed the benefits of introducing an educational brochure on SUPC prevention for mothers. The introduction of this educational material significantly increased mothers' awareness and feelings of safety for their newborns.

Study limits

Articles were searched in three databases (ScienceDirect, Web of Science, and PubMed), in English, and only full texts were used.

CONCLUSIONS

In the delivery room, bonding between the mother and newborn is a critical nursing intervention, offering a multitude of benefits for both parties. However, due to the potential risk of Sudden Unanticipated Postnatal Collapse (SUPC) during Skin-to-Skin Contact (SSC), continuous observation of the newborn is imperative. As a result, nursing staff may utilize clinical monitoring methods such as the RAPPT scale, or instrumental monitoring methods like PCOM, EKG, and ComTech HOWDY. The most effective approach to monitoring involves a combination of these methods. Simultaneously, it is essential to prioritize the education of nursing staff regarding the risk and prevention of SUPC. Knowledgeable nursing staff can deliver professional and secure care while effectively educating mothers and their companions in the delivery room on the prevention of SUPC. This comprehensive approach ensures the safety and well-being of both newborns and mothers during this critical period.

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