REVIEW ARTICLE

REVISTA ENFERMAGEM ATUAL IN DERME

NURSES' (UN)KNOWLEDGE IN THE MANAGEMENT OF INVASIVE MECHANICAL VENTILATION: INTEGRATIVE REVIEW

EL (DES)CONOCIMIENTO DE LAS ENFERMERAS EN EL MANEJO DE LA VENTILACIÓN MECÁNICA INVASIVA: REVISIÓN INTEGRATIVA

(DES) CONHECIMENTO DE ENFERMEIROS NO MANEJO DA VENTILAÇÃO MECÂNICA INVASIVA: REVISÃO INTEGRATIVA

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ABSTRACT
Objectives: To identify and analyze nurses' (un) knowledge about the management of invasive mechanical ventilation. Method: This is an integrative review carried out in four databases using the descriptors "mechanical ventilation", "nursing", "knowledge", "lack of knowledge" (english language) and "ventilação mecânica", "enfermagem" and "conhecimento" (portuguese language); making a final sample of 12 articles. Results: Knowledge deficits related to pulmonary protection strategies, adjustment of parameters and ventilation modes, and recognition of complications related to mechanical ventilation were identified. In addition, there was a lack of competence in coordinating nursing care and minimal participation of nurses in decisions related to mechanical ventilation. Conclusion: Ventilatory assistance is a challenge for nurses as it requires specific theoretical and practical knowledge. There is a need to invest in improving this knowledge to improve the quality of care.
Keywords: Nursing; Artificial Breathing; Knowledge; Critical Care; Critical Care Nursing.

RESUMEN
Objetivos: Identificar y analizar el (des)conocimiento de las enfermeras sobre el manejo de la ventilación mecánica invasiva. Método: Se trata de una revisión integradora realizada en cuatro bases de datos utilizando los descriptores "mechanical ventilation", "nursing", "knowledge", "lack of knowledge" (idioma inglês) y "ventilación mecánica", "enfermería" y "conocimiento" (idioma portugués); haciendo una muestra final de 12 artículos. Resultados: Se identificaron déficits de conocimiento relacionados con las estrategias de protección pulmonar, ajuste de parámetros y modos de ventilación y reconocimiento de complicaciones relacionadas con la ventilación mecánica. Además, hubo una falta de competencia en la coordinación de los cuidados de enfermería y una participación mínima de las enfermeras en las decisiones relacionadas con la ventilación mecánica. Conclusión: La asistencia respiratoria es un desafío para el enfermero ya que requiere conocimientos teóricos y prácticos específicos. Es necesario invertir en mejorar este conocimiento para mejorar la calidad de la atención.
Palabras clave: Enfermería; Respiración Artificial; Conocimiento; Cuidados críticos, Enfermería de Cuidados Críticos.

RESUMO
Objetivos: Identificar e analisar o (des)conhecimento de enfermeiros quanto ao manejo da ventilação mecânica invasiva. Método: Trata-se de uma revisão integrativa realizada em quatro bases de dados utilizando os descritores "*mechanical ventilation*", "*nursing*", "*knowledge*", "*lack of knowledge*" (idioma inglês) e "ventilação mecânica", "enfermagem" e "conhecimento" (idioma português); perfazendo uma amostra final de 12 artigos. Resultados: Foram identificados déficits de conhecimento relacionados a estratégias de proteção pulmonar, ao ajuste de parâmetros e de modos ventilatórios e ao reconhecimento de complicações relacionadas à ventilação mecânica. Além disso, constatou-se falta de competência de coordenação de cuidados de enfermagem e participação mínima do enfermeiro nas decisões relacionadas à ventilação mecânica. Conclusão: A assistência ventilatória é um desafio para o enfermeiro pois requer conhecimentos teóricos e práticos específicos. Há a necessidade de se investir no aprimoramento destes conhecimentos para melhorar a qualidade do atendimento.
Palavras-chave: Enfermagem; Respiração Artificial; Conhecimento; Cuidados Críticos; Enfermagem de Cuidados Críticos.

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INTRODUCTION

Mechanical Ventilation (MV) is defined as the total or partial replacement of spontaneous ventilation, being indicated in acute respiratory failure or in acute exacerbations of chronic respiratory failure in order to promote adequate gas exchange, reduce the work of the respiratory muscles and decrease the metabolic demand.[1] It represents the main life support treatment in critically ill patients.[2]

It can be used in two ways: non-invasive (through an external interface, such as a face mask) or invasive (through an endotracheal tube or tracheostomy tube). the world[4] and is made possible through mechanical ventilators, which are inspiratory assistance devices that integrate volume, pressure, time and flow to provide a tidal force under positive pressure.[5]

The nursing team, as a member of the multidisciplinary team, actively participates in administrative and care actions involving invasive and non-invasive support in patients on mechanical ventilation. and the fan.[2]

Nursing care for patients receiving invasive or non-invasive ventilatory support includes: care with circuits, filters and humidifiers, cleaning and maintenance of equipment, care during bed baths, evaluation of signals, analysis and recording of mechanical ventilation parameters, monitoring, patient repositioning, control of endotracheal tube cuff pressure and proper fixation of the same, care for lesions in the oral cavity and face, use of closed aspiration system in hemodynamically unstable patients, oral hygiene, care with oral feeding and with enteral feeding.[6]

Care related to the prevention of bronchoaspiration, infection control and sedation, analgesia/sleep and wakefulness/pain can also be cited as good nursing practices for patients on invasive mechanical ventilation.[7]

Resolution of the Federal Nursing Council No. 639/2020 establishes that the Nurse is responsible for assembling, testing and installing mechanical ventilation devices, monitoring, checking alarms, initial adjustment and handling of mechanical ventilation parameters (these the last two under medical coordination) both in the invasive and non-invasive strategies. It also establishes that the Nurse is responsible for fixing, centralizing, positioning and monitoring the pressure of the cuff (cuff) of the endotracheal tube; carrying out and assessing the need for airway aspiration in patients under mechanical ventilation, carrying out and/or prescribing care in relation to the tracheostomy orifice and the integrity of the peristomal skin; performing and/or prescribing oral hygiene, including the use of antiseptic solutions; participation in the decision, performance and/or prescription of procedures related to pronation of patients under mechanical ventilation and application of care related to the prevention of associated incidents.[8]

Although nurses are theoretically able to provide such care, in practice, they perform unsatisfactorily in respiratory care, which can be attributed to non-compliance with clinical guidelines, their non-involvement in the

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development and implementation of protocols, lack of necessary resources, high costs and lack of time, skills and knowledge.[9] In view of the above, this study aimed to identify and analyze the (lack of) knowledge of nurses regarding the management of invasive mechanical ventilation.

METHODS

This is an integrative review and, as such, aims to synthesize results obtained in research on a topic or issue, in a systematic, orderly and comprehensive manner. It provides broader information on a subject/problem, thus constituting a body of knowledge.[10] This synthesis of knowledge already produced provides subsidies to improve the provision of care.[11]

The steps taken in this study were, sequentially: establishment of the hypothesis or research question, sampling or literature search, categorization of studies, evaluation of studies included in the review, interpretation of results and synthesis of knowledge or presentation of the review.[12]

The elaboration of the research question was based on the PICo strategy, which refers to the literal reduction of the following components: Patient (or Problem), Interest and Context. This strategy, in addition to guiding the construction of the research question, instrumentalizes the search strategy and allows the location of the best available scientific information.[13] Therefore, the guiding question of the study was delimited as follows: "What are the knowledge deficits of the nurses related to invasive mechanical ventilation, which make it difficult to provide adequate assistance to the patient undergoing this procedure?", with element "P" being the nurse, element "I" invasive mechanical ventilation and element "Co" referring to those who are under nursing assistance.

The search for primary studies took place from April to June 2020, in the following databases: National Library of Medicine (PubMed), Cumulative Index to Nursing and Allied Health Literature (CINAHL), SciVerse Scopus (SCOPUS) and Latin American Literature and of the Caribbean in Health Sciences (LILACS).

The selected controlled descriptors were "mechanical ventilation" and "nursing" (English language) from the Medical Subject Headings (MESH) and "mechanical ventilation" and "nursing" (Portuguese language) from the Health Science Descriptors (DeCS). The delimited uncontrolled descriptors were "knowledge" and "lack of knowledge" (English language) and "conhecimento" (Portuguese language).

The search strategy in the databases used the combination of controlled and uncontrolled descriptors through the Boolean operator "AND" in the following ways: "mechanical ventilation" AND "nursing" AND "knowledge" in PubMed and CINAHL; "mechanical ventilation" AND "nursing" AND "lack of knowledge" in SCOPUS and "mechanical ventilation" AND "nursing" AND "knowledge" in LILACS.

Inclusion criteria were complete articles that contained abstract and text on the topic of

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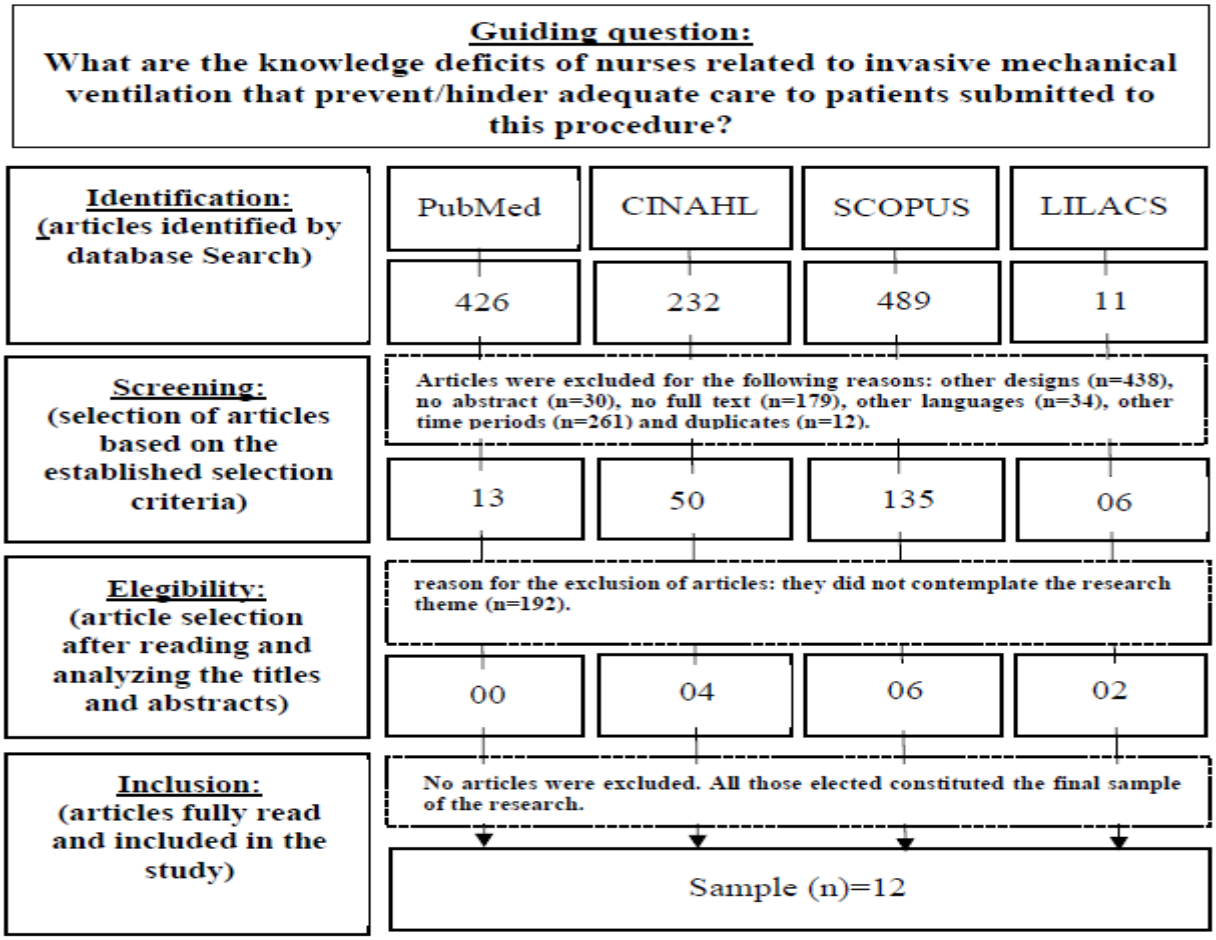
the research question in English, Spanish and Portuguese, published in the last ten years (2010 to 2020).

Literature review studies, secondary studies, experience reports, guidelines, response letters, manuals, editorials and studies that did not meet the scope of the review were excluded from the sample.

In the initial search, a total of 1158 publications were found. After applying the filters, according to the established inclusion criteria, and eliminating duplicate studies, 204 studies were obtained. Then, the titles and abstracts were read and analyzed, and studies that did not address the topic in the context of the research problem (n=192), such as sedation and use of medication in mechanical ventilation, nursing care not related to the patient on mechanical ventilation specifically, factors associated only with non-invasive mechanical ventilation, weaning, studies on conduct and knowledge of other professionals and other unrelated topics.

Thus, 12 articles were selected for reading in full, which met the guiding question, and constituted the final sample of this review. Such studies were organized in a table in Microsoft Word® for synthesis, based on the main results. The flow of selection of primary studies included in this integrative review from the databases is shown in Figure 1.

Figure 1 - Selection flow of primary studies included in the integrative review from the databases



Source: The authors

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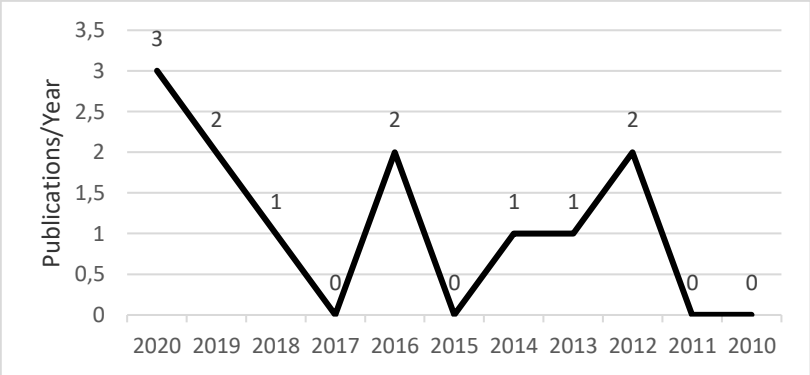
RESULTS

The largest number of publications included was from the SCOPUS database (n=06; 50%), followed by CINAHL (n=04; 33.3%) and LILACS (n=02; 16.7%); no studies were extracted from the PubMed database (n=0; 0%).

The predominant language was English (n=10, 83.3%) followed by Portuguese (n=02, 16.7%); studies in Spanish were not selected (n=0.0%). The 12 selected articles were published between 2012 and 2020, with the highest number of publications in 2020 (n=03, 25%) followed by 2019, 2016 and 2012 (n=02, 16.7% each) and 2018, 2014 and 2013 (n=1, 8.3% each). Figure 2 illustrates the number of primary studies in each year relative to the defined period of time.

Figure 2 - Number of primary studies in each year relative to the defined period of time (2010 to 2020).



Source: The authors

As for the country of origin of the publications, most of the studies were carried out in Brazil (n=03, 25%) and the others were carried out in different countries, mostly countries belonging to the Middle East (n=04, 33, 3%). Regarding the methodological approach, there was a predominance of quantitative studies (n=10, 83.3%) to the detriment of qualitative studies (n=2, 16.7%). Chart 1 presents the title, year of publication, country, objective, approach and synthesis of knowledge of the selected studies.

Chart 1 - Characterization of the studies included in the integrative review, consisting of Identifier (ID), title, year of publication, country, objective, approach and synthesis of knowledge of the selected studies.

ID	Title	Year	Country	Aim	Aproach	Knowledge synthesis
E01[14]	Nurses' knowledge, experience and self-	2020	Australia	To explore Australian intensive care nurses'	Quantitative	Participants are unaware of evidence-based guidelines for the prevention of ventilator-

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	reported adherence to evidence-based guidelines for prevention of ventilator-associated events: A national online survey			knowledge of ventilator-associated pneumonia and self-reported adherence to evidence-based guidelines for the prevention of ventilator-associated events.		associated pneumonia. There was no relationship between participants' knowledge and adherence to evidence-based guidelines.
E02[15]	Nurses' attitude, behavior, and knowledge regarding protective lung strategies of mechanically ventilated patients	2020	Palestine	To evaluate Palestinian intensive care nurses regarding attitude, behavior and knowledge about lung protection strategies for patients under mechanical ventilation.	Quantitative	Serious lack of knowledge about lung protection strategies of patients under mechanical ventilation was identified.
E03[16]	Critical care nurses' perception of care coordination competency for management of mechanically ventilated patients	2020	Saudi Arabia	To assess nursing care coordination competence for mechanically ventilated patients among intensive care nurses.	Quantitative	Identified subscale in the nursing care coordination competence for patients under mechanical ventilation and knowledge gaps.
E04[17]	Knowledge and practices of intensive care nurses on mechanical ventilation	2019	Turkey	To determine the use of mechanical ventilators by intensive care nurses and their knowledge, attitudes and	Quantitative	The professionals had insufficient knowledge in mechanical ventilation.

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				behaviors regarding care practices for patients under mechanical ventilation.		
E05[18]	Is the nurse prepared for the complications caused by mechanical ventilation?	2019	Brazil	To assess nurses' knowledge about complications related to mechanical ventilation.	Quantitative	86.36% of the nurses interviewed reported not having received enough information during the academy to care for a patient on mechanical ventilation and 77.52% claimed not knowing how to recognize complications related to mechanical ventilation.
E06[19]	The barriers to the prevention of ventilator-associated pneumonia from the perspective of critical care nurses: a qualitative descriptive study	2018	Iran	To explore Iranian nurses' perspectives on barriers to preventing ventilator-associated pneumonia in intensive care units.	Qualitative	Barriers to preventing ventilator-associated pneumonia have been named in three main categories: limited professional competence, unfavorable environmental conditions and inadequate management of human resources.
E07[20]	Knowledge level of nurses in Jordan on ventilator-associated pneumonia and preventive measures	2016	Jordania	Identify nurses' level of knowledge about ventilator-associated pneumonia	Quantitative	More than three-quarters of nurses had a low level of knowledge about pathophysiology, risk factors and preventive measures for ventilator-associated pneumonia.
E08[21]	Ventilator-associated complications: a study to evaluate the effectiveness of a planned teaching	2016	India	To assess the knowledge of intensive care nurses regarding ventilator-associated complications	Quantitative	53.40% of the nurses had only average knowledge about ventilator-associated complications.

	program for intensive care unit staff nurses- an Indian experience			and their prevention.		
E09[22]	Survey of Italian intensive care unit nurses' knowledge about endotracheal suctioning guidelines.	2014	Italy	To assess knowledge of evidence-based guidelines on endotracheal suctioning technique by Italian intensive care nurses in different hospitals.	Quantitative	The percentage of correct answers was 58% and no one completed the questionnaire without errors. Only 2.5% of nurses answered 9/10 questions correctly.
E10[23]	Critical care nurses' knowledge of, adherence to and barriers towards evidence-based guidelines for the prevention of ventilator-associated pneumonia - A survey study	2013	Finland	To explore critical care nurses' knowledge, adherence, and barriers to evidence-based guidelines for preventing ventilator-associated pneumonia.	Quantitative	The average score on the knowledge test was 59.9% and among the self-reported barriers were lack of knowledge, skills and guidance.
E11[24]	Mechanical ventilation: technical and scientific knowledge of nursing professionals in Intensive Care Units	2012	Brazil	To analyze the technical-scientific knowledge of nurses about mechanical ventilation.	Qualitative	Most professionals had doubts both regarding the adjustment of basic parameters and the modes of mechanical ventilation.
E12[25]	Mechanical ventilation: evidence for	2012	Brazil	To assess the knowledge of intensive care nurses about	Quantitative	Most nurses (65.1%) did not know the basics of ventilator parameters. The nurse's participation is minimal in

nursing care	mechanical ventilation.	defining parameters, extubation, weaning and aspiration.

Source: The authors

DISCUSSION

In the selected studies, knowledge deficits related to the entire MV management process stood out, from the initial criteria to start this therapy, its maintenance, nursing care and events associated with the ventilator.

As for the initial criteria for initiating MV, the nurse, in addition to having a failure to recognize emergencies that require ventilatory support, also has a lack of knowledge about the critical value of PaO2 and pH, in addition to the rate and type of critical breathing to start the procedure.[17]

When MV has already started, this lack of knowledge persists now related to adjustments in ventilator parameters, demonstrating a low level of knowledge of nurses in making the necessary adjustments[16,24] as well as knowing the causes of high and low ventilator pressure alarms mechanical, the meaning and functions of the terms PEEP, FiO217 and ventilatory modalities.[25]

With regard to lung protection strategies, a study[15] showed that the vast majority of participants, when self-assessing themselves, tend to agree with the use or application of these strategies; however, in questions that assess the actual knowledge of nurses, it was evident that there was no mastery of this topic - only 11.8% were able to correctly answer half or more of the questions, which demonstrates the lack of knowledge on how to apply these techniques in practice.

As for knowledge of evidence-based practices for preventing ventilator-associated events, a study[14] found severe deficits in questions related to the use of kinetic beds versus standard beds, frequency of change in wall suction systems and type of airway humidifier. More specifically regarding Ventilator-Associated Pneumonia, it was shown in another study[20] that more than three quarters of nurses had a weak level of knowledge regarding the pathophysiology of this event and about evidence-based preventive measures.

There was also limited knowledge about reducing sedation, weaning from the ventilator and standards and protocols for oral care[19], in addition to lack of knowledge about maintaining adequate pressure on the endotracheal tube cuff, about continuous subglottic suction and use of equipment of individual protection during the endotracheal aspiration procedure.[23] About this last procedure, endotracheal aspiration, the lack of knowledge of related practical recommendations is widely reported.[14,22,23]

Recognition of ventilator-associated complications was also self-reported insufficient by nurses[18,21], as well as competence in coordinating care for the management of mechanically ventilated patients with an important deficit related to the ability to idealize and clearly articulate care.[16]

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Data reported in a study[18] illustrates how serious the knowledge deficit of nurses about MV is, where 81.8% of the professionals interviewed classified their knowledge about mechanical ventilation as regular or poor, in addition to half of these professionals reporting fear for the safety of a patient on MV under their care.

Such insecurity and lack of competence is reflected in practice, where the distancing of nurses in the management of mechanical ventilation to the detriment of other professionals such as doctors and physiotherapists is already a fact.[16,18,25]

There is a lack related to MV that accompanies nurses from graduation to professional practice.[25] The fact is that nurses do not obtain sufficient knowledge on the subject during nursing graduation18,24, they are not properly trained during professional practice[15,19,20,21,24] or receive ineffective training.[15,17,19]

The need for regular training programs is evidenced in several studies[14-17,19-23] and professionals aspire to train and improve their knowledge on the subject.[18,20,25]

FINAL CONSIDERATIONS

Mechanical Ventilation is an important resource for increasing the survival of critically ill patients, but if poorly managed, it can cause major complications for patients submitted to it, promoting morbidity and mortality. Nurses are assigned an important role in the process of patient care in ventilatory support, both in the planning of actions and coordination of the team, as well as in the more complex direct care offered to the patient.

In this study, it was found that ventilatory assistance constitutes a challenge for nurses and that this professional lacks specific theoretical and practical knowledge on this topic. Nurses deal with different mechanical ventilators, so it is necessary to know the details of each device and the patient-ventilator interaction. When working in a department characterized by providing assistance to critically ill patients, nurses must be aware of the entire process related to oxygenation support provided to patients,

Through high technology, knowledge and great progress in the field of health, it is possible to provide a better prognosis for patients on mechanical ventilation. The more one invests in the knowledge of a nursing professional, there is a substantial improvement in the quality of care.

Therefore, this study achieved its main objective, as nurses' knowledge deficits were better understood in the context of patients under invasive ventilatory support.

This review's contribution to nursing involves reflection on these identified knowledge deficits, so that these gaps can be filled through training and educational activities so that these professionals can fully assume their role in managing the care of patients on invasive ventilatory support.

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