



# Evaluation of the kangaroo method during the Covid-19 pandemic in two reference maternity hospitals in Pernambuco


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## Abstract

*Objectives: to evaluate the second stage of the Kangaroo Mother Care (KMC) and its integration with the third stage in maternity hospitals in Recife in the context of the coronavirus pandemic.*

*Methods: normative assessment carried out at the Kangaroo Neonatal Intermediate Care Unit (KNICU) in two public reference maternity hospitals for KMC between November/2021 and May/2022. The logical model and matrix of KMC indicators were developed and validated using the Delphi Method: semi-structured interviews were carried out with professionals from the KNICU team and the municipal child health coordination. It was considered implemented when the criteria were met (from 100.0 to 80.0%); partially implemented (79.9 to 60.0%); incipient (59.9 to 40.0%) and not implemented (<or=39.9%).*

*Results: the MC was partially implemented in both KNICU (79.0% both). The Structure dimension was implemented (84.0 and 97.0%) and the Process dimension, in the Education (70.0% both) and Management components, were partially implemented (61.0% and 78.0%), although the units claim that they do not share clinical objectives, exams and treatments and do not have an effective referral/counter-referral system. While Assistance was implemented in one unit (90.0%) and partially implemented in the other (75.0%).*

*Conclusion: KNICU was partially implemented during the coronavirus pandemic in the two reference maternity hospitals, but with obstacles to integration with the third stage of the method.*

**Key words** *Premature birth, Kangaroo-mother care method, COVID-19, Health evaluation, Process assessment, Health care*



## Introduction

Prematurity is a challenge for perinatal care. According to estimates, one out of ten babies is born prematurely worldwide, and in 2020, approximately one million babies died due to it, as it is considered the main cause of death for children under five years of age.<sup>1</sup> Furthermore, millions of children remain with sequelae and disabilities, besides the technological development, as well as the development observed in perinatal care, which increased the survival rate of preterm low weight neonates. Thus, the need for providing postnatal care focused in a better development for preterm newborns (PTNB) is evident, in order to fully perform all their capabilities.<sup>1,2</sup>

Kangaroo Method (KM) is a strategy for decreasing infant mortality and for qualification of neonatal care, as it is recognized for the early skin-to-skin contact provided by the “Kangaroo Care”, which assumes diverse characteristics in the countries that adopt it.<sup>3-5</sup> In Brazil, it consists in three stages, the first two at the hospital: one in the Neonatal Intensive Care Unit (NICU) and other in the Conventional Neonatal Intermediate Care Unit (CNICU), and the other in the Kangaroo Neonatal Intermediate Care Unit (KNICU). The third one occurs after hospital discharge, by means of the sharing of the care between the maternity of origin and the Basic Health Unit (UBS – Portuguese acronym) for following-up the child until he/she reaches 2500g.<sup>3,4,6</sup>

Preterm or low birth weight children need specialized treatment during hospitalization and hospital discharge, as well as support and monitoring of the primary healthcare team (APS – Portuguese acronym). At the KNICU, besides the reception and qualified assistance for both the PTNBs and their families, guidelines and encouragement for maintaining the shared follow-up of children, which is shared by the outpatient clinic and the APS.<sup>7</sup>

In the face of a public health emergency of international interest, the international sanitary regulation recommends that national health systems be structured to respond to the resulting needs. Similarly, in face of Covid-19 pandemic, enacted in March 2020, health services adopted several strategies for its challenging.<sup>8</sup> Among them, restrictive measures that implied in the need for adaptations for the assistance provided to the mother-child binomial.<sup>9</sup>

Initially, contradictory global guidelines were published, which caused negative impacts for KM continuity,<sup>10-13</sup> yet it was posteriorly identified that the benefit of maintaining the method is 65 to 630 times higher than the risk of dying from Covid-19.<sup>11</sup> Despite of this, a study about the KM carried out in 62 countries observed substantial changes in the services related to PTNB.<sup>12</sup>

Assessing the repercussions of the coronavirus pandemic in the PTNB and low weight neonates is

essential to continue the integrative assistance for this group. Studies on diversified interventions signalize the fact that the assessment and monitoring are tools that favor choices of effective and essential actions for their full implementation when pointing barriers that restrict the achievement of better results.<sup>14,15</sup> This study aimed to assess the second stage of KM and its integration with the third stage in maternity hospitals in Recife in the coronavirus pandemic context.

## Methods

Normative assessment of KNICU, in which the resources employed, their organization, the services and goods produced were compared with the criteria and regulations established by the Ministry of Health (MH).<sup>16</sup>

The survey was carried out in the KNICU of two public maternity hospitals located in the municipality of Recife. The maternity A is a philanthropic entity, focused in high-risk and is one of the National Reference Centers for KM. At first, the Neonatal Unit (NU) had 18 NICU beds, 32 CNICU beds and 22 KNICU beds.<sup>17</sup> However, during Covid-19 pandemic, the institution became the maternity of reference in the state for assistance to pregnant women with SARS-Cov-2, implying in the temporary interruption of the KNICU, which reopened in the end of 2021, with five beds that increased progressively until ten beds in the period of data collection.

The maternity B is a unit for high-risk births as well, acts as a reference in the state for KM and has 15 NICU beds, 15 CNICU beds and eight KNICU beds, with two extra beds.<sup>18</sup> During Covid-19 pandemic the KNICU had no interruption of medical care, although the sanitary restrictions reduced the number of hospitalizations.

For the execution of the assessment, we elaborated a logic model of the second stage of KM (Table 1). The modeling of intervention considered the donabedian triad structure, process and result, in which structure refers to physical, human and material resources needed for providing care; the process refers to activities developed by health professionals; and result, to the effects obtained in healthcare.<sup>19</sup>

For the building of the logical model, institutional documents and technical standards concerning KM were consulted. Among them: Ordinance SAS/MS n° 930/2012, Ordinance GM/MS n° 1683/2007 and the KM handbooks: Kangaroo method: care guidelines (2019), Handbook of the third stage of Kangaroo Method in Basic Care (2018), Humanized care for the newborn: Kangaroo Method: technical handbook (2017), Guidelines for Kangaroo Method in Basic Care: Shared Care (2016) and Shared Follow-up between Hospital Care and Basic Care (2015). Local strategies for the application of KM policy, such

Table 1

Logic model of the second stage of the kangaroo method. Recife, Pernambuco, Brazil, 2021.	
Component	Structure
Education	Human resources: Manager, Physician, Nurse, Physiotherapist, Psychologist, Speech Therapist, Case worker, Nursing Technician
Assistance	Physical Resources: room for meetings, courses or activities. Nursery with 5m <sup>2</sup> for bed/crib; Ambience room; hand washing sink Material Resources: Bed for genitor; simple incubator; manual Resuscitator; Electronic Scale, Material for resuscitation, dock and calendar; stethoscope; thermometer; mobile aspirator; mobile armchair; Mobile Incubator; otoscope; Sphygmanometer; Nebulizer and mask; Ophthalmoscope, Hand sanitizer dispenser
Management (Integration of the 2 <sup>nd</sup> and 3 <sup>rd</sup> stages in Kangaroo Method)	Guidelines for parents/caregivers: breastfeeding and supplementation; execution of kangaroo method for as much time as possible; Recognition of alert signs; Follow-up after hospital discharge Physical exam and assessment of growth and development considering adjusted gestational age Exams (laboratory, transfontanelar ultrasound, universal neonatal hearing screening, funduscopy) Monitoring of prescribed medication Use of strategies for dealing with pain and stress Assistance to mother in breastfeeding and milk extraction, hygiene of the newborn, change of diapers, bath and position of the child Encouragement for family and support network visitations Encouragement to the participation of the father or other reference figure of the mother-baby dyad Resume of discharge Qualification of health professionals Communication of the Intermediate Care Unit, Sanitary District or Basic Health Unit depending on the local reality Reference and counter-reference between maternity and Basic Health Unit Existence of follow-up clinical manager Existence of clinical objectives, Shared exams and treatment Viability of the follow-up consultation of the 3 <sup>rd</sup> stage Regulation of reception of the neonate by the primary healthcare, of the assistance by the Center of Family Health Support and specialized
	Processes (Activities)
	Higher adherence to the care preconized in kangaroo method Higher adherence to breastfeeding Strengthening of the mother-baby bond Promotion of adequate follow-up of growth and development Present support network Professionals qualified for adequate, integrative and multidisciplinary assistance. Adhesion to the third stage of the method Increase in the reception of newborns hospitalized in Kangaroo Method in the Basic Health Unit
	Intermediate results
	Impact
	Higher adhesion to kangaroo method Reduction of morbidity and mortality during 2 <sup>nd</sup> and 3 <sup>rd</sup> stages

as Plans and state and municipal laws were not included, since they are not generalized for the entire country.

Lastly, the logical model presented three components: 1) Education, relating the guidelines to parents and caregivers, 2) Assistance, referring to care for the PTNB, specifically, and 3) Management, which is related to the integration between the second and third stages of the method and qualification of the multidisciplinary team. From the logical model, a judgment matrix and indicators were created, representing the structure and process for each component of the model and defined as parameters according to the Ordinances and Handbooks consulted, and when not available, it was established by the main researcher by means of previous experience in a teaching hospital.

Aiming to expand the validity of the construct and the reliability, the judgment matrix and indicators were submitted to review by a group of specialists in the area of the survey, using a technique for achieving consensus, the Delphi Method. Details about the methodological procedures used in the technique were previously described and published.<sup>20</sup>The final judgment and indicators matrix was composed of 51 indicators, distributed into 26 structure indicators and 25 process indicators (Table 2).

The period of data collection occurred between November 2021 and May 2022, using a tool for collection based on indicators of the judgment matrix and organized considering the components of the KNICU. Professionals of higher education from the multidisciplinary team that act on the KNICUs were included in the survey, as well as the KM coordinators of these services and the manager of the health department of the municipality, and professionals who were on vacation or medical leave during data collection. The semi-structured interviews were carried out with nine professionals of maternity A, a medical coordinator, a nursery coordinator, two assistance nurses, two physicians, a speech therapist, a physiotherapist and two psychologists. In maternity B, nine professionals were interviewed: a medical coordinator, a nursery coordinator, three assistance nurses, a physician, a speech therapist, an occupational therapist and a psychologist.

In order to evaluate how many criteria and standards of KM were achieved, the level of implementation was expressed by the proportion of the score obtained in relation to the maximum score for each component and for the service as a whole, related to structure and process, according to the judgment and indicators matrix. In order to classify the level achieved by the KNICU, the following cutoff points were adopted: implemented, when achieving percentages from 100.0% to 80.0%, partially implemented, between 79.9% and 60.0%, incipient, between 59.9% and 40.0% and non-implemented, lower or equal to 39.9%.

The guidelines from 466/12 resolution of the National Health Council were followed and the study was approved by the IMIP Research Ethics Committee CAAE n° 35017420.7.3002.5201 and by the HAM Research Ethics Committee, CAAE n° 35017420.7.3001.5197.

## Results

In both services, the KNICU was considered partially implemented (79.0%) during Covid-19 pandemic. The Structure dimension was implemented in Maternity B (84.0%) and Maternity A (97.0%). In the Process dimension, the component Education was partially implemented and both services obtained the same proportion (70.0%). The component Assistance was implemented in maternity B (90.0%) and partially implemented in maternity A (75.0%); whilst the Management component was partially implemented in maternity B (61.0%) and maternity A (78.0%) (Table 3).

With regard to the structure of the KNICUs, maternity B did not have a physiotherapist, nor incubators or portable aspirators, whilst maternity A did not have a mobile incubator in the department. In the Education component, the indicators with lower scores in maternities B and A were: “Proportion of professionals who guide parents and caregivers about artificial feeding” (75.0% and 62.5%, respectively); “Proportion of professionals who guide parents and caregivers about the recognition of alert signs” and “Proportion of professionals who guide parents and caregivers about follow-up after hospital discharge” (both with 87.5% and 75.0%, respectively) (Table 3).

With regard to the Assistance component, in maternity B, 100.0% of professionals reported to stimulate the participation of fathers or other reference figure for the mother-baby dyad, and the visitation of relatives and social support networks, whilst 87.5% of professionals of maternity A reported the same; 100.0% of professionals of maternity B reported to help mothers in breastfeeding and extraction of milk, against 62.5% of professionals of maternity A. In relation to the Management component, qualifications on the method occurred in both services, with 77.0% of professionals of maternity B reporting to have accomplished courses, whilst in maternity A it was 90.0%. Similarly, professionals of both units reported to have a clinical manager and communication of the KNICU with the state and municipal health secretariats, sanitary district or UBS (Basic Health Units). Nevertheless, professionals of maternity B affirmed that there is no sharing of clinical goals, exams and treatments nor the effective existence of a reference and counter-reference system with the UBS, whilst those from maternity A informed that these actions do not always occur (Table 3).

Table 2

Judgment and indicators matrix of the second stage of kangaroo method, Recife, Pernambuco, Brazil, 2023.			
Second stage of kangaroo method			
Dimension	Indicator	Parameter	Maximum score
Structure	Existence of coordinator physician	(1) physician, neonatologist or pediatrician. Technical manager with minimum labor of 4hr	0.4 point
	Ratio of daily physician per bed	(1) physician, neonatologist or pediatrician, day laborer (minimum 4h) per 15 beds	0.4 point
	Ratio of existent physicians per turn per bed	(1) assistant physician, neonatologist or pediatrician. Per turn per 15 beds	0.4 point
	Existence of coordinator nurse	(1) nursery coordinator with minimum daily labor of 4h	0.4 point
	Ratio of nurses per turn per bed	(1) nurse per turn per each 15 beds	0.4 point
	Ratio of physiotherapists per turn per bed	(1) physiotherapist per turn per 15 beds	0.4 point
	Existence of speech therapist	(1) speech therapist	0.4 point
	Ratio of nursery technicians per turn per bed	(1) nursery technician per 5 beds	0.4 point
	Existence of nutritional assistance	Guaranteed access to bedside service	0.3 point
	Existence of psychological assistance/occupational therapy	Guaranteed access to bedside service	0.3 point
	Existence of nursery	5m <sup>2</sup> nursery for bed/crib	0.3 point
	Existence of ambience room	Ambience room	0.3 point
	Existence of sink for hand washing	Sink for hand washing in each room	0.3 point
	Proportion of beds for genitors	(1) Bed per genitor	0.3 point
	Proportion of incubators per beds total	At least 20% of beds	0.3 point
	Proportion of acrylic cribs per beds total	At least 80% of beds	0.3 point
	Ratio of manual resuscitators per newborns	(1) per 5 NBs	0.4 point
	Existence of electronic scale	(1) Electronic scale	0.3 point
	Ratio of materials for resuscitation in bed	(1) per 15 beds	0.4 point
	Ratio of stethoscope per bed	(1) per bed	0.3 point
	Ratio of thermometers per bed	(1) per bed	0.3 point
	Ratio of mobile aspirators per bed	(1) per 15 beds;	0.3 point
	Existence of clock and calendar	Clock and calendar	0.2 point
Ratio of removable armchairs per bed	(1) per bed;	0.3 point	
Existence of hand sanitizer dispenser	In every rooms	0.4 point	
Materials that can be shared with the Conventional Neonatal Intermediate Care Unit:			
- Existence of mobile incubator	- (1) mobile incubator	0.3 point	
- Ratio of otoscopes per bed	- (1) per 15 beds	0.3 point	
- Ratio of sphygmomanometer per bed	- (1) per 15 beds	0.3 point	
- Ratio of ophthalmoscope per bed	- (1) per 15 beds	0.3 point	
- Ratio of nebulizer and mask per bed	- (1) per 4 beds	0.3 point	
Structure Subtotal			10 points
Component – Education			
Proportion of professional that guide and encourage parents and caregivers to maintain breastfeeding	100% of professionals	2 points	
Proportion of professionals that guide parents and caregivers to supplemental feeding	100% of professionals	2 points	
Proportion of professionals that guide parents and caregivers about the execution of kangaroo method as much as possible	100% of professionals	2 points	
Proportion of professionals that guide parents and caregivers about recognition of alert signs	100% of professionals	2 points	
Proportion of professionals that guide parents and caregivers about follow-up after discharge	100% of professionals	2 points	
Subtotal			10 points
Process			
Proportion of professional that guide and encourage parents and caregivers to maintain breastfeeding	2: ≥ 90%/ 1: < 90 and ≥ 50%/ 0: < 50%	2 points	
Proportion of professionals that guide parents and caregivers to supplemental feeding	2: ≥ 90%/ 1: < 90 and ≥ 50%/ 0: < 50%	2 points	
Proportion of professionals that guide parents and caregivers about the execution of kangaroo method as much as possible	2: ≥ 90%/ 1: < 90 and ≥ 50%/ 0: < 50%	2 points	
Proportion of professionals that guide parents and caregivers about recognition of alert signs	2: ≥ 90%/ 1: < 90 and ≥ 50%/ 0: < 50%	2 points	
Proportion of professionals that guide parents and caregivers about follow-up after discharge	2: ≥ 90%/ 1: < 90 and ≥ 50%/ 0: < 50%	2 points	
Subtotal			10 points

<b>Component - Assistance</b>					
	Proportion of professionals that perform physical exam	100% of professionals responsible by the physical exam	2 points	2: $\geq 90\%$ / 1: $< 90$ and $\geq 50\%$ / 0: $< 50\%$	
	Proportion of professionals that assess growth and development considering adjusted gestational age	100% of professionals responsible by the assessment of growth and development	2 points	2: $\geq 90\%$ / 1: $< 90$ and $\geq 50\%$ / 0: $< 50\%$	
	Proportion of professionals that request complementary exams	100% of professionals responsible by the request of complementary exams	2 points	2: $\geq 90\%$ / 1: $< 90$ and $\geq 50\%$ / 0: $< 50\%$	
	Proportion of professionals that monitor prescribed medication	100% of professionals responsible the monitoring of medicines	2 points	2: $\geq 90\%$ / 1: $< 90$ and $\geq 50\%$ / 0: $< 50\%$	
	Proportion of professionals that use strategies for dealing with pain and stress during procedures	100% dos professionals	1 point	1: $\geq 90\%$ / 0.5: $< 90$ and $\geq 50\%$ / 0: $< 50\%$	
<b>Process</b>	Proportion of prescriptions of painkillers when requested	100% of professionals responsible prescribing painkillers	1 point	1: $\geq 90\%$ / 0.5: $< 90$ and $\geq 50\%$ / 0: $< 50\%$	
	Proportion of professionals that help mothers with breastfeeding and milk extraction	100% of professionals	2 points	2: $\geq 90\%$ / 1: $< 90$ and $\geq 50\%$ / 0: $< 50\%$	
	Proportion of professionals that help mothers with the hygiene of the newborn. Change of diapers. Bath and position of child.	100% of professionals	2 points	2: $\geq 90\%$ / 1: $< 90$ and $\geq 50\%$ / 0: $< 50\%$	
	Proportion of professionals that encourage the visitation of relatives and support network	100% of professionals	2 points	2: $\geq 90\%$ / 1: $< 90$ and $\geq 50\%$ / 0: $< 50\%$	
	Proportion of professionals that encourage the participation of the father or other reference figure of the mother-baby dyad	100% of professionals	2 points	2: $\geq 90\%$ / 1: $< 90$ and $\geq 50\%$ / 0: $< 50\%$	
	Proportion of professionals that fulfill the discharge report	100% of professionals	2 points	2: $\geq 90\%$ / 1: $< 90$ and $\geq 50\%$ / 0: $< 50\%$	
	Subtotal		20 points		
	<b>Component - Management</b>				
		Existence of trainings or qualification courses about Kangaroo method for professionals of the health team	Yes	1.1 point	1.1: Yes/ 0: No
		Proportion of the team that performed kangaroo method	100% of the team performed kangaroo method	1.2 point	1.2 $\geq 90\%$ / 0.6: $< 90$ and $\geq 50\%$ / 0: $< 50\%$
	Existence of communication of the Kangaroo Intermediate Care Unit with state and municipal health secretariats, sanitary district or basic health unit depending on the reality of the localization	Yes	1.1 point	1.1: Yes/ 0: No	
	Existence of reference and counter-reference between maternity and Basic Health Unit	Yes	1.1 point	1.1: Yes/ 0: No	
<b>Process</b>	Existence of follow-up clinical manager	Yes	1.1 point	1.1: Yes/ 0: No	
	Existence of clinical objectives. shared treatment and exams	Yes	1.1 point	1.1: Yes/ 0: No	
	Inexistence of duplication of consultations. Medications and exams.	Yes	1.1 point	1.1: Yes/ 0: No	
	Existence of viability of consultation of follow-up in third stage	Yes	1.1 point	1.1: Yes/ 0: No	
	Existence of regulation of the reception of the neonate by primary health care, of the assistance of the Center of Family support, and specialized	Yes	1.1 point	1.1: Yes/ 0: No	
Subtotal			10 points		
Subtotal Process			40 points		
Total			50 points		

Table 3

Level of implementation of the second stage of the Kangaroo Method. Recife, Pernambuco, Brazil, 2023.

Dimension	Indicator	Maternity B		Maternity A	
		Observed	Attributed value	Observed	Attributed value
Structure	Existence of coordinator physician	Yes	0.4	Yes	0.4
	Ratio of daily physician per bed	According to the standard	0.4	According to the standard	0.4
	Ratio of existent physicians per turn per bed	Nonconforming	0	According to the standard	0.4
	Existence of coordinator nurse	Yes	0.4	Yes	0.4
	Ratio of nurses per turn per bed	According to the standard	0.4	According to the standard	0.4
	Ratio of physiotherapists per turn per bed	nonconforming	0	According to the standard	0.4
	Existence of speech therapist	Yes	0.4	Yes	0.4
	Ratio of nursery technicians per turn per bed	According to the standard	0.4	According to the standard	0.4
	Existence of nutritional assistance	Yes	0.3	Yes	0.3
	Existence of psychological assistance/occupational therapy	Yes	0.3	Yes	0.3
	Existence of nursery	Yes	0.3	Yes	0.3
	Existence of ambience room	Yes	0.3	Yes	0.3
	Existence of sink for hand washing	Yes	0.3	Yes	0.3
	Proportion of beds for genitors	Yes	0.3	Yes	0.3
	Proportion of incubators per beds total	100.0%	0.3	100.0%	0.3
	Proportion of acrylic cribs per beds total	0%	0	125.0%	0.3
	Ratio of manual resuscitators per newborns	100.0%	0.3	125.0%	0.3
	Existence of electronic scale	According to the standard	0.4	According to the standard	0.4
	Ratio of materials for resuscitation in bed	Yes	0.3	Yes	0.3
	Ratio of stethoscope per bed	According to the standard	0.4	According to the standard	0.4
Ratio of thermometers per bed	100.0%	0.3	125%	0.3	
Ratio of mobile aspirators per bed	100.0%	0.3	125%	0.3	
Existence of clock and calendar	nonconforming	0	According to the standard	0.3	
Ratio of removable armchairs per bed	Yes	0.2	Yes	0.2	
Existence of hand sanitizer dispenser	100.0%	0.3	100.0%	0.3	
Materials that can be shared with the Conventional Neonatal Intermediate Care Unit	Yes	0.4	Yes	0.4	
- Existence of mobile incubator	Yes	0.3	No	0	
- Ratio of otoscopes per bed	According to the standard	0.3	According to the standard	0.3	
- Ratio of sphygmomanometer per bed	According to the standard.	0.3	According to the standard	0.3	
- Ratio of ophthalmoscope per bed	According to the standard	0.3	According to the standard	0.3	
- Ratio of nebulizer and mask per bed	According to the standard	0.3	According to the standard	0.3	
Structure judgment	Implemented	8.4 points (84.0%)	Implemented	9.7 points (97.0%)	

Component- Education		2.0	100.0%	2.0	100.0%	2.0
	Proportion of professional that guide and encourage parents and caregivers to maintain breastfeeding	2.0	100.0%	2.0	100.0%	2.0
Process	Proportion of professionals that guide parents and caregivers to supplemental feeding	1.0	75.0%	1.0	62.5%	1.0
	Proportion of professionals that guide parents and caregivers about the execution of kangaroo method as much as possible	2.0	100.0%	2.0	100.0%	2.0
	Proportion of professionals that guide parents and caregivers about recognition of alert signs	1.0	87.5%	1.0	75.0%	1.0
	Proportion of professionals that guide parents and caregivers about follow-up after discharge	1.0	87.5%	1.0	75.0%	1.0
	Judgment of component	Partially Implemented	07 points (70.0%)	Partially Implemented	07 points (70.0%)	
Component - Assistance		2.0	100.0%	2.0	100.0%	2.0
	Proportion of professionals that perform physical exam	1.0	75.0%	1.0	87.5%	1.0
	Proportion of professionals that assess growth and development considering adjusted gestational age	2.0	100.0%	2.0	100.0%	2.0
	Proportion of professionals that request complementary exams	2.0	100.0%	2.0	100.0%	2.0
	Proportion of professionals that monitor prescribed medication	0.5	87.5%	0.5	87.5%	0.5
Process	Proportion of professionals that use strategies for dealing with pain and stress during procedures	0.5	75.0%	0.5	75.0%	0.5
	Proportion of professionals that help mothers with breastfeeding and milk extraction	2.0	100.0%	2.0	62.5%	1.0
	Proportion of professionals that help mothers with the hygiene of the newborn. Change of diapers. Bath and position of child.	2.0	100.0%	2.0	100.0%	2.0
	Proportion of professionals that encourage the visitation of relatives and support network	2.0	100.0%	2.0	87.5%	1.0
	Proportion of professionals that encourage the participation of the father or other reference figure of the mother-baby dyad	2.0	100.0%	2.0	87.5%	1.0
	Proportion of professionals that fulfill the discharge report	2.0	100.0%	2.0	100.0%	2.0
Judgment of component	Implemented	18 points (90.0%)	Partially Implemented	15 points (75.0%)		
Component - Management		1.1	Yes	1.1	Yes	1.1
	Existence of trainings or qualification courses about Kangaroo method for professionals of the health team	0.6	77.7%	0.6	90.0%	1.2
	Proportion of the team that performed kangaroo method	1.1	Yes	1.1	Yes	1.1
Process	Existence of communication of the Kangaroo Intermediate Care Unit with state and municipal health secretariats, sanitary district or basic health unit depending on the reality of the localization	0	No	0	Not always	0
	Existence of reference and counter-reference between maternity and Basic Health Unit	1.1	Yes	1.1	Yes	1.1
	Existence of follow-up clinical manager	0	No	0	Not always	0
	Existence of clinical objectives, shared treatment and exams	0	No	0	Not always	0
	Inexistence of duplication of consultations, medications and exams	1.1	Yes	1.1	Yes	1.1
	Existence of viability of consultation of follow-up in third stage	1.1	Yes	1.1	Yes	1.1
	Existence of regulation of the reception of the neonate by primary health care, of the assistance of the Center of Family support and specialized	1.1	Yes	1.1	Yes	1.1
Judgment of component	Partially Implemented	6.1 points (61.0%)	Partially Implemented	7.8 points (78.0%)		
Process Judgment	Partially Implemented	31.1 points (77.7%)	Partially Implemented	29.8 points (74.5%)		
Level of implementation of kangaroo method	Partially Implemented	39.5 points (79.0%)	Partially Implemented	39.5 points (79.0%)		

\*Implemented (100 to 80%); Partially implemented (79.9 to 60%); Incipient (59.9 to 40%); Non-implemented (lower or equal to 39.9%).



## Discussion

The study demonstrated that during the coronavirus pandemic, the second stage of KM was partially implemented in both reference services and presented impairments to the integration with the third stage of the method. On the other hand, whilst the structure dimension was implemented, there were variations in the level of implementation within the components of the process dimension, with the components Education and Management partially implemented and the component Assistance implemented and partially implemented, respectively, for each health unit.

During the pandemic, the maternity A KNICU, one of the National Reference Centers (CNR – Portuguese acronym), was temporarily closed while acting as a state reference for pregnant women with coronavirus, and their professionals were relocated in other departments of the institution. The reopening of the KNICU was gradual, which may explain its partial implementation. A study carried out in 2015 identified that all maternities indicated as CNR of the method and 66.7% of those of state reference presented all their stages implemented.<sup>21</sup> The difference of these results with those of our assessment, besides the pandemic onset and the hiatus of almost ten years between the surveys<sup>21</sup> may occur due to the fact of the indicators matrix has normative updates, which did not exist previously, or having used different criteria of judgment.

The interruption of KNICU in maternity A was also found in several countries that adopted the centralized response strategy for isolation and treatment of Covid-19.<sup>12</sup> Such strategy altered the care provided to newborns (NB) that included relocation in the space of the unit, the redistribution of the neonatal care team for tasks related to Covid-19, and even the mother-baby separation not only for mothers who tested positive for Covid-19, but also the suspect ones, interrupting the continuity of care provided to mothers and NBs.<sup>11,12</sup> In Brazil, the MH guideline was to not reduce or close the KNICUs,<sup>22</sup> although several maternities were affected in the country.

Rao *et al.*<sup>12</sup> identified that KM was the routine practice of 85% of interviewees previously to the pandemic, and during the pandemic, 55%. The repercussions of coronavirus pandemic on KM included the reduction of skin-to-skin contact (26.5%), earlier discharge (30.8%), total interruption of KM services (7%) or restrict policies of visitation (51.2%).<sup>23</sup>

In the present study, professionals of both services reported having stimulated visitation of relatives of the support network. In spite of that, during pandemic, with the social distancing measures, there were restrictions in the policy of visitation and the involvement of family with

care for the NB, besides the other consequences verified for KM.<sup>9,11,12,22-24</sup> Such measures included impairments in maternal mental health, hindering the bond with the NB and the adherence to KM.<sup>24</sup> With the proper support of the KNICU team, such damages can be mitigated, favoring a positive effect in the interaction and care of the NB.<sup>9,24,25</sup> However, aspects related to uncertainties, guidelines and availability of personal protection equipment brought fear for life, stress and worry within the NB caregivers.<sup>12</sup>

The structure dimension was implemented in the two assessed services, and this is one of the relevant aspects in the strategy of humanization of care. Accordingly, professionals and patients interviewed about the environmental desirable attributes in a KNICU highlighted the importance of the comfortable environment, with privacy, controlled access, with furniture and ergonomic equipment in sufficient quantity.<sup>26</sup>

In this study, the proportion of professionals that guide parents and caregivers about recognition of alert signs was suboptimal, with lower values in maternity A than in maternity B. This inadequate orientation to parents may be associated with other factors related to the institution or the professionals.<sup>27-29</sup> Also, some professionals recognize certain activities as attribution of other members of the team. Besides, a survey demonstrated that some professionals tend to prioritize the immediate assistance, disregarding educational activities and the preparation for hospital discharge.<sup>27</sup>

Similar to the finding about alert signs, the proportion of professionals that guide parents and caregivers about the follow-up after discharge had a low adherence. Differently, the MH recommends and studies bring the relevance of the preparation for discharge by means of adequate guidance to families concerning the continuity of assistance in the third stage of KM and the link between mothers and primary healthcare teams.<sup>27,28</sup> A survey carried out in a mother-and-child teaching hospital identified that although nurses are aware of the KM benefits, low knowledge about KM is predominant, with scarce experience, resistance from the team and insufficient institutional support for its implementation.<sup>27</sup> Thus, the problems that may occur in households are not sufficiently valued and predicted, and the solutions, not properly informed.<sup>29</sup>

In the component Management, some weaknesses were identified in both services during the pandemic that were partially implemented. The absence of sharing of clinical objectives, exams and treatments for KNICU, previous outpatient clinic and Basic Health Unit are barriers for an effective network of reference and counter-reference, impairing the integration between second and third stages of KM.<sup>28</sup> Studies indicate a fragile communication between the different levels of care, fragmenting and discontinuing care, where primary healthcare professionals minimize

their importance in the third stage of KM, and sometimes, the clinical communication with the specialized service is assumed by the NB caregivers.<sup>3,5</sup> This weakness may reverberate in the increase of late neonatal mortality, mainly in the pandemic context, in which the government guideline was the temporary interruption of follow-up consultations in outpatient clinics and their execution by primary healthcare teams.<sup>3,22</sup>

These difficulties are exposed in a survey that identified a significant number of mothers that did not receive visitations at home in the first week of hospital discharge and related this to a probable lack of adequate orientation on the importance of shared care with APS, by KNICU professionals. It also demonstrated that these professionals, even recognizing the importance of primary healthcare, believed to be unprepared to deal with PTNB or low birth-weight newborns and needed to be qualified.<sup>3</sup>

With regard to the qualification of professionals that act on KM, an expressive number of interviewed professionals referred having qualification on the method, however with distinct percentages in the institutions, higher in maternity A. Qualifications and updates for the team about KM are essential for ensuring quality of assistance in all its stages for patients and their families, promoting emotional support for the team to feel confident about their conduct.<sup>12,25,30</sup>

As limitations of this study, in spite of the normative assessment effectiveness when criteria and ministry standards are achieved, it does not clarify the reason of non-implementation, yet it draws hypotheses in a pandemic context. Furthermore, the pandemic period itself interfered with the result of assessment, since the challenges imposed to professionals and services generated specific impairments for the implementation of KM.

The KNICU was partially implemented during the coronavirus pandemic in both reference maternities, with barriers for the integration with the third stage of the method for its full implementation. Whilst the Structure dimension was implemented in both units, the Process dimension was partially implemented in all its components, with exception of the Assistance component in maternity B. We highlight the need for qualifying professionals for KM, as well as making them aware of the execution of educational activities. The broadly recognized benefits of the method signalize the need for valuing its continuity, even with adaptations in a context of public health emergencies of international interest such as coronavirus pandemic. We reinforce the importance of promoting strategies that integrate the second and third stages, mainly with primary health care teams, for a qualified and integrative assistance for children after hospital discharge.

## Author's contribution

Cândido JLA, Frias PG and Sarinho SW: conceptualization of the project, data analysis and interpretation, writing and critical review of the manuscript. All authors approve the final version of the manuscript and declare no conflicts of interest.

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