

Are international recommendations for the management of PAS applicable in LMIC?

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Abstract

Objective: The aim of this study was to explore the opinion of placenta accreta spectrum (PAS) experts in low- and middle-income countries (LMIC) on the applicability of recognized clinical practice guidelines (CPGs) on the diagnosis and treatment of PAS in limited resource settings.

Methods: This is an observational, survey-based study. PAS experts from LMIC were approached for their opinions on the application of each of the recommendations included in four PAS clinical practice guidelines.

Results: 65 responses were obtained (response rate 41.1%), representing 27 middle income countries. The results of this survey suggest that the care of PAS patients in middle income countries is far from what is recommended by international CPGs. Participants in this survey-based study point out that the insufficient availability of hospital infrastructure, the conditions of local health systems and lack of medical team preparation are the reasons for deviating from the CPG recommendations. Two thirds of the participants surveyed describe the absence of centers of excellence in their country and that in more than half of the PAS referral hospitals, there are no interdisciplinary teams dedicated to managing this disease.

Conclusion: The care of patients with PAS in middle income countries frequently deviates from established CPG recommendations largely due to limitations in local resources and infrastructure. Practical guidelines and training designed for resource poor settings are needed.

Keywords: Placenta Accreta spectrum, Clinical practice guidelines, low middle income countries.

Synopsis: The care of patients with PAS in LMIC frequently deviates from international practice guideline recommendations.

Introduction

Placenta accreta spectrum (PAS) is an iatrogenic obstetrical disorder associated with serious complications, including maternal death. Outcomes are optimized with: **A**wareness of risk factors, **A**ccurate prenatal diagnosis, **A**dequate preparation, and **A**ppropriate management (IS-PAS 4-A strategy) **(1)**. A robust health system with adequate resources and an experienced multidisciplinary team makes a significant difference in PAS outcomes. Currently, considerable variations in the methods of management exist **(2,3)**. In 2018, the FIGO published guidelines for the diagnosis and management **(2,3)** of PAS, including a majority of participating experts from high-income countries. Additionally, in recent years, several scientific societies with high impact in LMICs have issued their own management guidelines for PAS **(4-6)**, once again, primarily focused on the use of a wide range of technological and human resources, not always available in LMICs.

The increase in PAS incidence in recent years can be attributed to an exponential rise of caesarean section rates, and this trend is projected to continue **(7)**. This has disproportionately affected low- and middle-income countries (LMIC) **(8)**, particularly Latin America **(9)**, Asia and North Africa, **(10)** where access to the healthcare system, access to adequate ultrasound equipment, trained surgical teams, and essential resources such as intensive care units and blood transfusion is limited. **(9)**.

It has been previously reported how international clinical practice guidelines (CPGs) do not always account for regions with limited resources, making their implementation difficult for local professionals **(11)**. In response to the global health plea to share experiences of using clinical practice guidelines in low-resource settings **(11)**, we aimed to evaluate the opinion of PAS experts in LMIC on the applicability of recognized CPGs on the diagnosis and treatment of PAS in various settings.

Materials and methods

An observational, survey-based study was conducted, and PAS experts from LMIC were included seeking their opinions on the application of each of the recommendations included in four PAS clinical practice guidelines **(2-5,12)**

Selection and recruitment of participants: There is no internationally accepted definition for a "PAS expert", based on criteria such as years of experience or number of cases attended. For this study, we defined "PAS expert" as an author of scientific articles on PAS included in PubMed in the last 5 years.

We conducted a PubMed/Medline search (January 2018 to March 2023) for articles that included the following terms: "accreta", "placenta accreta spectrum", "abnormally invasive placenta," and whose authors reported affiliation to institutions in low- and middle-income countries, as defined by the World Bank country income

classification. The corresponding authors were emailed and asked to invite their co-authors to participate in the survey. Between March 2023 and April 2023, three invitations to participate were sent to potential participants.

Clinical practice guidelines (CPGs): Two international PAS CPGs (**2-4,12**) and two CPGs from globally recognized national scientific societies (**5,6**) were considered. A list of recommendations were made, and questions related to the applicability of each recommendation in the local context were built.

Survey: A standardized survey was designed and shared by email to PAS experts in LMIC (**Supplementary material: Survey**). The survey was designed to obtain data about the general characteristics of the PAS management offered in the country and hospital where the PAS expert works.

To ensure face validity, the initial draft of the survey was evaluated in two rounds, the first by members of the International Society for PAS (IS-PAS) LMIC Working Group and the second by four LMIC PAS surgeons. The modifications suggested by those who completed the survey during this evaluation process were included in the final version of the survey.

After each closed question in the survey, participants were encouraged to share their opinions on each point dealt with as it related to the recommendations included in each of the international guidelines in a free text field. At the end of the survey, participants were asked to write their overall opinion on the usefulness and applicability of the international PAS guidelines in the LMICs where they worked.

Additionally, we collected demographic characteristics and previous experience in the management of PAS of the participants, followed by two sections of questions on the treatment and diagnostic strategies commonly used in their country, ending with a section dedicated to exploring the opinions and previous experiences with telemedicine for the management of obstetric emergencies and PAS.

Statistics: Data collected were stored in an electronic database. Qualitative variables were determined, and descriptive statistics were used for the analysis, with data expressed in absolute frequencies or percentages. The opinions of the authors in the free text boxes were qualitatively analyzed and included in the discussion.

Further analysis looked for differences in outcomes between hospitals with moderate to high patient flow (quartiles 2 to 4 of the number of patients with PAS seen per year) and low patient flow (quartile 1).

We agreed that recommendation that were not applied in $\geq 20\%$ of cases constituted a frequent deviation from the management guideline.

The study protocol did not to meet the criteria of human subject research and was exempted by the institutional review board at Fundacion Valle de Lili, Cali, Colombia (protocol No.1930).

Results

We identified and contacted 158 PAS experts in LMIC, representing 34 countries. We received 65 responses (**Supplementary material. Figure 1**), representing 27 middle income countries (MICs, **Supplementary material. Table 1**). Experts from low-income countries (LICs) were identified from their publications PubMed/Medline (representing 2 countries), but the authors did respond to the initial nor reminder emails.

General characteristics of the hospitals where the participants work are described in **Table 2**. Fifteen (23.1%) participants reported that their hospital has insufficient resources to manage PAS. On a scale from 1 to 10, the experts scored the median difficulty for patients to access their referral hospitals for PAS as 5 (IQR 3-6.5) and in almost half of the hospitals (44.6%) surgeries for PAS are carried out by obstetrician-gynecologists on call during the shift the day when the patient was admitted to the hospital and not by a multidisciplinary team.

In **Table 3** the reported management outcomes of patients with PAS are shown. The median number (IQR) of patients diagnosed with PAS per year was 13 (8-40). The most widely used delivery management approach for those patients was total hysterectomy (n=29, 44.6%) followed by various uterine sparing surgery techniques (n=22, 33.8%), with 40 (61.5%) hospitals reporting application of uterine sparing surgery for PAS at least once in the last 5 years.

Details of imaging techniques, such as ultrasonography and magnetic resonance imaging (MRI) use for the diagnosis of PAS are described in **Table 4**.

Table 5 presents the recommendations included in CPGs (FIGO guidelines) that were not met in more than 20% of the surveys received, as well as the most common reasons for these deviations as described by the participants. Resource limitations and lack of identified centers of excellence were evident. Specifically, 66.2% of respondents say that such centers do not exist in their country and 83.1% lack consistent cell salvage technology. More than half of the respondents (55.4%) report that their hospital does not ensure that patients with PAS are delivered by personnel with PAS surgical expertise.

Table 6 (supplementary material) shows the comparison of results between hospitals with low patient flow (quartile 1: ≤ 8 PAS patients per year) and those with high flow (quartiles 2 to 4: >8 cases per year). The number of participants and the design of the study do not allow the use of statistical tests for comparison. However, the results suggest that compared to hospitals with low patient flow (< 8 cases/year,) hospitals with high patient flow more frequently have resources including interdisciplinary teams (87.5% vs 58.8%) and intraoperative cell saver (20.8% vs

5.9%). Similarly, uterine sparing surgery is utilized more frequently in hospitals that see a greater number of patients per year (39.6% vs 17.6%).

Discussion

The results of this survey suggest that the care pathways and management of patients with PAS in MICs deviates frequently from what is recommended by international CPGs and suggest that the recommended care in LICs may be even less achievable. Participants in the present survey point out that the lack of adequate hospital infrastructure, resources within local health systems and lack of preparation of medical teams are the reasons for the differences between the guidelines and clinical reality (**Table 5**).

In a study from the USA good clinical outcomes in PAS were closely linked with two factors: the engagement of skilled interdisciplinary teams and the provision of care within specialized referral centers (**13**). However, two thirds of the participants in this research describe the absence of "centers of excellence" in their country and that in more than half of the PAS referral hospitals there are no interdisciplinary teams dedicated to managing this disease (**Table 5**).

Most maternal mortalities worldwide occur in LMICs. Of notable concern is the substantial number of preventable deaths that could have been averted through simple interventions (**14**) outlined in CPGs established several years ago (**15**). Several factors contribute to the lack of implementation of CPGs, with the most influential being the significant disparity between international recommendations and locally feasible best practices (**11**). Although groups who developed PAS CPGs included representatives from various world regions (**2-4,12**), most recommendations were based on evidence or expert opinion from well-resourced settings. Frontline line healthcare practitioners who possess expertise in resource-constrained clinical environments are often underrepresented in the CPG development. Moreover, these guidelines are seldomly subjected to pilot testing among end-users or evaluated prior to implementation, thereby limiting generalizability (**11**). Indeed, the development of CPGs is a challenging endeavor due to the scarcity of high-quality scientific evidence and the presence of numerous data inconsistencies. This often gives rise to the paradoxical situation, with "too little, too late" being a common trait in LMICs, juxtaposed with "too much, too soon" in HICs (**16**).

In recent years, our understanding of the pathophysiology and management of PAS has evolved through international collaboration, even if some controversy remains (**10,17,18**). What is clear is that a "one size fits all" approach doesn't fit. For cases of PAS, it is essential to incorporate this risk - benefit assessment into the process of personalizing patient care. This survey illustrates that we must navigate how to tailor guidelines to fit best within unique healthcare settings and systems.

What can high resource countries learn from LMIC experts that differ from the guidelines? It has been said that necessity is the mother of invention. One in three (33.8%) participants said that their first management option for PAS was one step conservative surgery or another type of uterine sparing surgery. Overall, 61.5% of respondents mentioned the use of one step conservative surgery (a specific type of uterine sparing surgery) in their hospital in the last 5 years (**Table 3**). This approach was designed to reduce surgical complications while simultaneously providing definitive PAS treatment. Additionally, this approach addresses cultural or personal needs of those patients who do not feel comfortable with hysterectomy as the only option (**19**). Our results indicate that experts from MIC adopt this strategy.

Our survey shows that 1 in 4 respondents prefer PAS delivery after week 36, (**Table 3**) whereas all CPGs recommend doing so before that gestational age. The rationale for this practice in LMIC may include the uncertainty of gestational age estimation in these settings as well as the paucity of neonatal intensive care beds, preferring, to reduce iatrogenic prematurity, even if it means an increased risk of emergent delivery due to bleeding.

International CPGs should stimulate the development and adaptation of clinical practice guidelines at the national or even regional level, especially in LMIC. In this sense, it is necessary to recognize that few LMICs have the capacity to carry out such adaptations that are costly and time consuming for fragile health systems (**20**). The co-creation, the global sharing of experiences and the inclusion of solutions applicable to limited resources scenarios in international CPGs, facilitates this process of local adaptation. Knowing the reality of PAS management in LMICs is not easy, in fact the only PAS CPG that in its conception attempted a design for all set-ups requested the application of one participant in the guideline generating group from all gynecology and obstetrics national societies affiliated to FIGO. However, very few societies responded with a candidate and of more than 160 countries invited, only 50 international experts were linked to a survey from which only 36 responses were obtained. Only 3 of such survey responses corresponded to Africa and South America (**21**). Our survey also found difficulties. We focused only on people with a special interest in PAS (authors of PAS scientific articles) with professional practice in LMIC, but our response rate was only 41% and we did not achieve participation of any LIC. However, the uniformity of the results and reaching 27 MICs allows a slightly better approximation to the reality of scenarios with limited resources.

Participation of untrained personnel and use of inappropriate surgical techniques are the factors most frequently involved in maternal deaths due to PAS (**22**). Likewise, failures in the prenatal diagnosis of this condition are related to worse clinical results (**23**). Non-technical factors such as education of health personnel, administrative barriers to access to services, communication between groups, and dissemination of knowledge are key issues in the construction of LMIC applicable guidelines. The use of virtual medicine, accelerated with the COVID-19 pandemic, supports

telemedicine as a potentially useful strategy in limited resources settings, especially to facilitate prenatal diagnosis, provide consultation and to improve PAS teams' surgical performance (24).

Our goal is not to criticize the available PAS CPGs, which represent a great effort to improve the quality of care for this disease; on the contrary, we aim to highlight opportunities to review and improve upon said documents, with greater inclusivity and collaboration with experts from diverse settings. We do not endorse sub-standard practices, but rather advocate for a pragmatic approach to improve outcomes while considering the limitations of underserved populations. "Making end-users' perspectives count" or a "bottom-up approach" is one of the keys to building guidelines applicable to limited resources settings (11,25). Low-cost solutions to prevent blood loss, individualize management (18) and improve definitive diagnosis (26) are useful and appreciated in any setting and should be evaluated as alternatives to other highly expensive and rarely available interventions (interventional radiology, intraoperative cell recovery, massive transfusion) to facilitate the application of CPGs in LMIC and to improve resource utilization even in high income areas.

Conclusions

The care of patients with PAS in MIC frequently deviates from the international CPG recommendations, and even more so in LIC. The CPG for PAS must include the analysis of gaps and needs within limited resource settings, to drive national healthcare infrastructure and international public health policy related to care for patients with PAS.

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Author contributions:

Ethical approval:

Study planning:

Data collection and analysis:

Manuscript editing:

All authors read and approved the final manuscript.

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Figures and tables:

Table 1 Supplementary material. List of survey participants			
#	Country	Name of expert	Name of the hospital where the expert work
1	Argentina	Juan Pablo Pineda	Maternidad Oroño
2	Argentina	Ricardo García Mónaco	Hospital Italiano de Buenos Aires
3	Argentina	Basanta Nicolás Andrés	Hospital Fernández
4	Argentina	José Miguel Palacios-Jaraquemada	CEMIC University Hospital, Otamendi Hospital
5	Bolivia	Ronald Aparicio	Hospital materno infantil Germán Urquidí
6	Bolivia	Lorgio Rudy Aguilera Daga	Hospital de la mujer Dr Percy Boland Rodríguez
7	Brazil	Janete Vettorazzi	Hospital de Clínicas de Porto Alegre / RS
8	Brazil	Geam Karlo de Assis Santana	Hospital Regional de Betim
9	Brazil	Gabriel Costa Osanan	Federal University of Minas Gerais
10	Brazil	Conrado Milani Coutinho	Hospital das Clínicas da Faculdade de Medicina de Ribeirão Preto da Universidade de São Paulo
11	Brazil	Edward Araujo Júnior	Federal University of São Paulo
12	China	Hongmei Wang	Shandong provincial hospital affiliated to Shandong First Medical University
13	China	Ning Zhang	Department of Obstetrics and Gynecology, Renji Hospital, School of Medicine, Shanghai Jiaotong University, Shanghai
14	China	Huixia Yang	Peking University First Hospital
15	China	Yali Hu	Nanjing Drumtower Hospital
16	Colombia	Adriana Messa	Fundación Valle del Lili
17	Colombia	José Enrique Sanín Blair	Clinica bolivairia/ clinica el rosario tesoro
18	Colombia	Juan Manuel Burgos Luna	Fundación Valle de Lili
19	Ecuador	Vicente Enrique Yuen-Chon Monroy	Hospital de Especialidades Teodoro Maldonado Carbo
20	Ecuador	Wilson Mereci	Hospital Padre Carollo
21	Egypt	Saad El Gelany	Minia University
22	Egypt	Mahmoud Mohammed Ghaleb	Ain Shams University Maternity Hospital
23	Egypt	Mohamed Mohamed Tawfik	Mansoura University Hospitals
24	Egypt	Magdy Abdelrahman Mohamed	Sohag University Hospital
25	Egypt	Ahmed Elagwany	Shatby University Hospital
26	Egypt	Ahmed M Hussein	Cairo University
27	Egypt	Ahmed Mohamed Abbas	Assiut University Hospital
28	Egypt	Abdalla Mohamed Mahmoud Mousa	Cairo University Kasr Alainy Hospital
29	Egypt	Ayman Shehata Dawood	Tanta University

30	El Salvador	Ronald Edgardo López Guevara	Hospital Nacional de Mujer de El Salvador
31	El Salvador	Francisco Eduardo Turcios Mendoza	Instituto Salvadoreño del Seguro social
32	Ghana	Atta Owusu-Bempah	Komfo Anokye Teaching Hospital
33	Honduras	Luis Armando Zuñiga Giron	Hospital Nacional Mario Catarino Rivas
34	India	Vidyadhar Balkrishna Bangal	Pravara institute of medical Sciences, Loni
35	India	Vakkanal Paily Paily	Rajagiri Hospital, Aluva, Kerala
36	Indonesia	Rozi Aditya Aryananda	Dr Soetomo Academic General Hospital, Universitas Airlangga
37	Indonesia	Mohammad Adya Firmansha Dilmy	Dr. Cipto Mangunkusumo National Referral Hospital
38	Iran	Solmaz Chamanara	Kowsar hospital, Qazvin
39	Iran	Shaghayegh Moradi Alamdarloo	Shiraz University of Medical Sciences
40	Iran	Sedigheh Amooee	Shiraz University of medical Sciences
41	Lebanon	David Atallah	Hotel dieu de france university hospital, Saint joseph university
42	Malaysia	Nik Ahmad Zuky Nik Lah	School of Medical Sciences, Universiti Sains Malaysia
43	Malaysia	Roziana Ramli	Hospital sultanah nur zahirah, kuala terengganu
44	Mexico	Paulo Meade Treviño	Hospital Lomas de San Luis
45	Mexico	José Ignacio García de la Torre	Hospital General de Saltillo, Coahuila
46	Nicaragua	Maria Amparo Morales Acuña	Hospital Bertha Calderon Roque, Ministerio de Salud
47	Nicaragua	Néstor Javier Pavón Gómez	Hospital de Referencia Nacional Bertha Calderón Roque
48	Nicaragua	Luis Raúl Altamirano Miranda	Hospital Alemán Nicaragüense
49	Nigeria	Godwin Akaba	University of Abuja Teaching Hospital, Abuja
50	Nigeria	George Eleje	Nnamdi Azikiwe University
51	Pakistan	Maria Imran	King Edward Medical University
52	Peru	Julio Cesar Fernandez Haqquehua	Instituto Nacional Materno Perinatal
53	Rwanda	Balkachew Kabtyimer	King Faisal Hospital
54	South Africa	Nnabuike Chibuke Ngene	Department of Obstetrics and Gynaecology, School of Clinical Medicine, University of the Witwatersrand, Johannesburg, Gauteng
55	Thailand	Pavit Sutthritpongsa	Faculty of Medicine Siriraj hospital Mahidol university
56	Thailand	Savitree Pranpanus	Songklanagarind Hospital, Prince of Songkla University
57	Turkey	Ayşe Keleş	Umraniye Training and Research Hospital
58	Turkey	İsmet Hortu	Ege University School of Medicine Department of Obstetrics and Gynecology, Izmir
59	Turkey	Hüseyin Durukan	Mersin University, Faculty of Medicine
60	Turkey	Duygu Adiyaman	Uniklinik Ulm
61	Uganda	Dr SSebadduka Peter	Mulago Specialized Women and Neonatal Hospital
62	Uganda	Henry Mark Lugobe	Mbarara University of Science and Technology, Department of Obstetrics and Gynecology
63	Venezuela	Rafael Cortés Charry	Hospital Universitario de Caracas. Universidad Central de Venezuela
64	Vietnam	Anh Dinh Bao Vuong	Tu Du Hospital
65	Vietnam	Phuc Nhon Nguyen	Tu Du Hospital

Table 2. General characteristics of the hospitals that treat PAS in LMIC

Variable			Result. n (%)
Type of hospital	Urban		63 (96.9%)
Availability of resources to manage PAS	Enough resources		51 (78.5%)
	Insufficient resources		15 (23.1%)
Years of experience managing PAS. Median (IQR)			10 (8-15)
Number of patients with PAS you have cared for last year. Median (IQR)			13 (8-40)
In your country there are hospitals accredited as centers of excellence in the management of PAS		Yes	22 (33.8%)
What criteria define the centers of excellence for the management of PAs in your country? ^a	That/those hospitals have multiple medical specialties and physical resources such as interventional radiology, blood bank and intensive care		10 (45.5%)
	They are tertiary level university hospitals where obstetricians are educated		6 (27.3%)

	There is an interdisciplinary team specifically dedicated to treating PAS, clinical results are monitored and compared with peer hospitals, research is carried out.	3 (13.6%)
	A national entity has accredited that/those hospitals	3 (13.6%)
How many referrals centers ^b for PAS are there in your country?	0	6 (9.2%) ^d
	1-5	21 (32.3%) ^e
	6-10	8 (12.3%) ^d
	>10	30 (46.1%) ^f
How difficult is it for any patient with PAS to access those referral hospitals for PAS (1 been very easy and 10 very difficult) . Median (IQR)		5 (3-6.5)
PAS patients in your hospital are operated on by the doctors on duty on the day of surgery, regardless of whether those doctors have training in PAS or not?	Yes	29 (44.6%)
What approximate percentage of PAS patients in your hospital are taken for elective surgery (absence of bleeding) . Median (IQR)		80 (50-90)
Do you have a PAS experienced interdisciplinary team at your hospital?	Yes	52 (80%)
How is the surgical team that treats patients with PAS in your hospital, composed? ^c	Obstetrician	52 (80%)
	Anesthetist	43 (66.1%)
	General, trauma or vascular surgeon	32 (49.2%)
	Urologist	32 (49.2%)
	Critical care specialist	15 (23.1%)
	MFM specialist	14 (21.5%)
	Neonatologist	13 (20%)
	Radiologist	11 (16.9%)
	Hematologist or hemotherapy specialist	10 (15.4%)
	Gynecologist-oncologist	8 (12.3%)
	urogynecologist	4 (6.1%)
	Resident	3 (4.6%)
	Perioperative nurse	3 (4.6%)
	Hemodynamist	3 (4.6%)
	Colorectal surgeon	1 (1.5%)
	Internist	1 (1.5%)
PAS: placenta accreta spectrum. LMIC: low or middle-income country. IQR: interquartile range. MFM: maternal fetal medicine ^a Only in case the local expert said that there are centers of excellence in his country (n=22). ^b Hospitals recognized for their expertise in PAS management. ^c Professionals included in the PAS team of each hospital. ^d 6 countries ^e 15 countries ^f 9 countries		

Table 3. Practices in the Treatment of PAS in LMIC

Variable		Result. n (%)
What type of skin incision is used in your hospital for patients with PAS?	Midline vertical	28 (43.1%)
	Transverse suprapubic	32 (49.2%)
	Other	5 (7.7%)
Is tranexamic acid available in your country?	Yes	65 (100%)
Do you have tranexamic acid in your hospital?	Yes	65 (100%)
Do you administer tranexamic acid to all patients with PAS?	Yes	51 (78.5%)
Do you have an intraoperative cell salvage device in your hospital?	Yes	11 (16.9%)
Does your hospital have a transfusion service?	Yes	65 (100%)
Does your hospital have a blood bank?	Yes	54 (83.1%)
Does your hospital have the capacity for massive transfusions ^a ?	Yes	60 (92.3%)

Can your transfusion service respond to a cryoprecipitate transfusion request for a case of active obstetric bleeding?	Yes	54 (83.1%)
What is the preferred treatment ("first option" in most cases) for patients with PAS in your hospital?	Total hysterectomy	29 (44.6%)
	One Step Conservative Surgery	17 (26.1%)
	Subtotal hysterectomy	7 (10.8%)
	Other types of conservative surgical management	5 (7.7%)
	Caesarean section and hysterectomy in a second surgical stage	2 (3.1%)
	Leaving the placenta in situ	1 (1.5%)
	Other	4 (6.2%)
In the last 5 years, has your hospital used scheduled (or planned) deferred hysterectomy ^b for PAS?	Yes	9 (13.8%)
In the last 5 years, has your hospital used leaving the placenta in situ as a treatment for PAS?	Yes	8 (12.3%)
In the last 5 years, has your hospital used One Step Conservative Surgery ^c as a treatment for PAS?	Yes	40 (61.5%)
In which patients have you performed or are you performing OSCS?	None	23 (35.4%)
	If, after surgical staging, focal PAS is identified or appropriate conditions for uterine reconstruction after focal resection	24 (36.9%)
	In young patients with desire for fertility	11 (16.9%)
	In "most patients"	5 (7.7%)
	In patients with CSP operated in the first trimester or PAS operated in the second trimester	2 (4.6%)
At what gestational age do patients with PAS and placenta previa, without evidence of bleeding or other complications, are taken to caesarean section in your hospital?	Between 34 and 36 weeks	49 (75.4%)
	Between 36 and 37 weeks	7 (10.8%)
	After 37 weeks	9 (13.8%)
Did an unexpected intraoperative PAS diagnosis ever happen in your hospital?	Yes	57 (87.7%)
What percentage of all PAS patients are diagnosed intraoperatively ^d in your hospital? . Median (IQR)		10 (3-17.5)
What is the course of action taken in your hospital when faced with a PAS intraoperative finding in a patient without bleeding and with fetal well-being?	The PAS team or an experienced obstetrician is called to proceed immediately with the surgery	37 (56.9%)
	Obstetricians who find the intraoperative diagnosis of PAS complete the cesarean hysterectomy	19 (29.2%)
	C-section completed; hysterectomy deferred	6 (9.2%)
	We do not have a defined protocol for those cases	3 (4.6%)
Is it possible in your hospital to defer a cesarean section in the case that PAS is diagnosed intraoperatively, if the mother and fetus are stable?	Yes	31 (47.7%)
Do you have endovascular therapy ^e service available at your hospital?	Yes	35 (53.8%)
If your hospital has an endovascular therapy service ^e , do they have experience in pelvic vessel embolization or temporary pelvic artery balloon occlusion?	Yes	29 (82.8%)
PAS: placenta accreta spectrum. LMIC: low or middle-income country. IQR: interquartile range. ^a 10 units of red blood cells in 24 hours ^b cesarean section with placenta in situ in the first surgery, followed by hysterectomy several days later in a second surgery ^c uterine sparing surgery in which the uterine segment affected by PAS is resected and the uterus is reconstructed ^d unexpected case of PAS ^e fluoroscopy room, hemodynamic room, or interventional radiology room		

Table 4. Practices in the diagnosis of PAS in LMIC hospitals

Variable	Results. n (%)	
In patients with a history of previous caesarean section, is an evaluation of the placental insertion area routinely performed?	Yes	55 (84.6%)

What percentage (approximate) of women who gave birth in your hospital had previously undergone a detailed US scan in the second trimester? Median (IQR)		80 (50-90)
What percentage (approximate) of women who gave birth in your hospital have undergone prenatal check-ups? Median (IQR)		90 (60-100)
Do you have MRI in your hospital?	Yes	48 (73.8%)
If you would prefer to do an MRI for the placenta, would that be possible in your country (even if she will be transferred to another hospital)?	Yes	52 (80%)
In which situation would you request an MRI in a patient with suspected PAS?	In cases of posterior placenta, suspected parametrial lesion or diagnostic doubts after US evaluation	33 (50.8%)
	In case of suspicion of compromise of neighboring organs or very severe cases to the evaluation	11 (16.9%)
	Never or rarely	10 (15.4%)
	In all or almost all cases	8 (12.3%)
	For research purposes only	3 (4.6%)
PAS: placenta accreta spectrum. LMIC: low or middle-income country. IQR: interquartile range. US: ultrasound		

Table 5. Recommendations for the management of PAS that frequently (>20%) are not applied

Recommendation	Frequency of deviation (%)	Reason (s) for taking a different behavior
It is recommended to have cell salvage available	54/65 (83.1)	The equipment is not available in the hospital
Patients with PAS must have their birth in centers of excellence	43/65 (66.2)	There are no hospitals accredited as centers of excellence in the country
Surgical expertise must be ensured during PAS care	36/65 (55.4)	PAS patients are operated on by the doctors on duty on the day of surgery, regardless of whether those doctors have training in PAS or not. There is no PAS experienced interdisciplinary team
Faced with an unexpected intraoperative finding of PAS during a caesarean section with stable mother and baby, the caesarean section should be deferred until the available resources are available	43/65 (52.3)	There is no defined protocol for these cases. There is no other better equipped hospital to refer to. Usually, obstetricians who find the intraoperative diagnosis of PAS complete the cesarean hysterectomy
The hospital where PAS is treated must have the necessary resources	15/65 (23.1)	There is no other better equipped hospital in the region. Conditions specific to the health system that limit timely referral to equipped hospitals
In scheduled cases, without bleeding or other complications, it is recommended to end the pregnancy at week 34 0/7 -35 6/7	16/65 (24.6)	The low availability of neonatal intensive care units motivates surgeries scheduled at a higher gestational age to reduce the admission of newborns to these units. Due to late diagnosis and/or delay in the referral process, patients arrive late at referral hospitals
MRI can help in the evaluation of the placenta percreta extension or in the evaluation of areas that are difficult to evaluate with ultrasound.	13/65 (20)	There is no MRI service in the hospital. It is not possible to transfer the patient to another hospital for MRI
PAS: placenta accreta spectrum. MRI: magnetic resonance imaging		

Table 6 Supplementary material. Comparison of results in PAS depending on the volume of patients treated each year				
Variable		PAS patients per year		
		All hospitals	≤8 cases (n=17)	>9 cases (n=48)
Number of patients with PAS you have cared for last year *		13 (8-40)	5 (3-5)	30 (12-48)
Years of experience managing PAS *		10 (8-15)	10 (6-14)	10 (9-15)
Availability of resources to manage PAS	Enough resources	50 (78.5%)	12 (70.6%)	38 (79.2%)
PAS patients in your hospital are operated on by the doctors on duty on the day of surgery, regardless of whether those doctors have training in PAS or not?	Yes	29 (44.6%)	10 (58.8%)	19 (39.6%)
Do you have a PAS experienced interdisciplinary team at your hospital?	Yes	52 (80%)	10 (58.8%)	42 (87.5%)
Do you have an intraoperative cell salvage device ("cell saver" or other) in your hospital?	Yes	11 (16.9%)	1 (5.9%)	10 (20.8%)
Does your hospital have the capacity for massive transfusions (> 10 units of red blood cells in 24 hours)?	Yes	60 (92.3%)	15 (88.2%)	45 (93.7%)
Can your transfusion service respond to a cryoprecipitate transfusion request for a case of active obstetric bleeding?	Yes	54 (83.1%)	13 (76.4%)	42 (87.5%)
What is the preferred treatment ("first option" in most cases) for patients with PAS in your hospital?	Total hysterectomy	29 (44.6%)	9 (52.9%)	20 (41.7%)
	Subtotal hysterectomy	7 (10.8%)	3 (17.6%)	4 (8.3%)
	Caesarean section and hysterectomy in a second surgical stage	2 (3.1%)	1 (5.9%)	1 (2.1%)
	Leaving the placenta in situ	1 (1.5%)	1 (5.8%)	0
	OSCS	17 (26.1%)	3 (17.6%)	14 (29.2%)
	Other types of conservative surgical management	5 (7.7%)	0	5 (10.4%)
	Other	4 (6.2%)	0	4 (8.3%)
In the last 5 years, has your hospital used OSCS as a treatment for PAS?	Yes	40 (61.5%)	6 (35.3%)	34 (70.8%)
In which patients have you performed or are you performing OSCS?	None	23 (35.4%)	11 (64.7%)	12 (25%)
	In young patients with desire for fertility	11 (16.9%)	2 (11.8%)	9 (18.7%)
	If, after surgical staging, focal PAS is identified or appropriate conditions for uterine reconstruction after focal resection**	24 (36.9%)	4 (23.5%)	20 (41.7%)
	In "most patients"	5 (7.7%)	0	5 (10.4%)
Did a situation with an unexpected intraoperative PAS diagnosis ever happen in your hospital?	Yes	57 (87.7%)	16 (94.1%)	41 (85.4%)
Is it possible in your hospital to defer a cesarean section in the case that PAS is diagnosed intraoperatively, if the mother and fetus are stable?	Yes	31 (47.7%)	6 (35.3%)	25 (52.1%)

PAS: Placenta accreta spectrum. OSCS: One step conservative surgery (uterine sparing surgery in which the uterine segment affected by PAS is resected and the uterus is reconstructed)

* Median (interquartile range)

**Criteria such as involvement of the anterior wall of the uterus, more than 50% of the healthy uterine circumference, healthy myometrium over the cervix, etc.

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