What is Placenta Accreta Spectrum (PAS) and who gets it?

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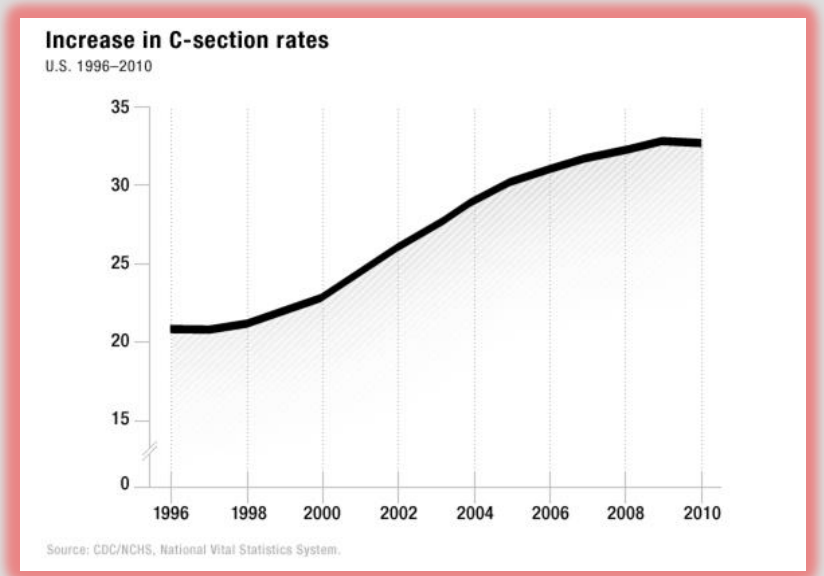
DISCLOSURES

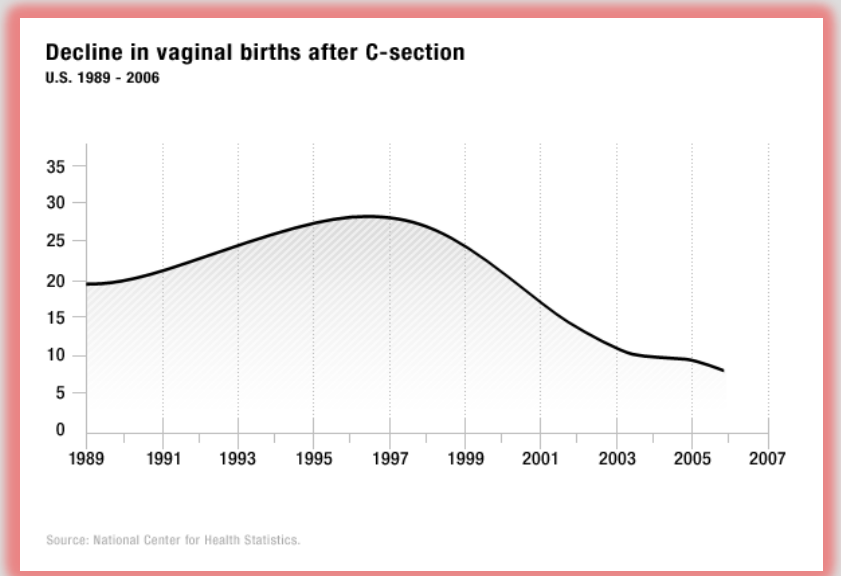
- No financial disclosures to report at this time.
- All patient consents have included the use of images for educational and research purposes

OBJECTIVES

- Review the epidemiology and risk factors for PAS
- Discuss limitations in determining PAS prevalence
- Uncover the pathophysiology of PAS and its clinical relevance

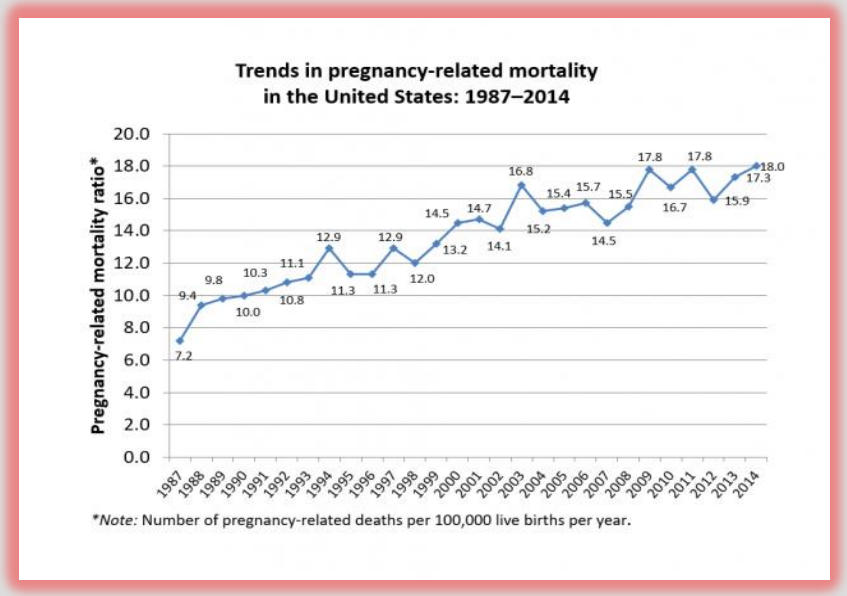
THE RISE OF CESAREAN SECTIONS

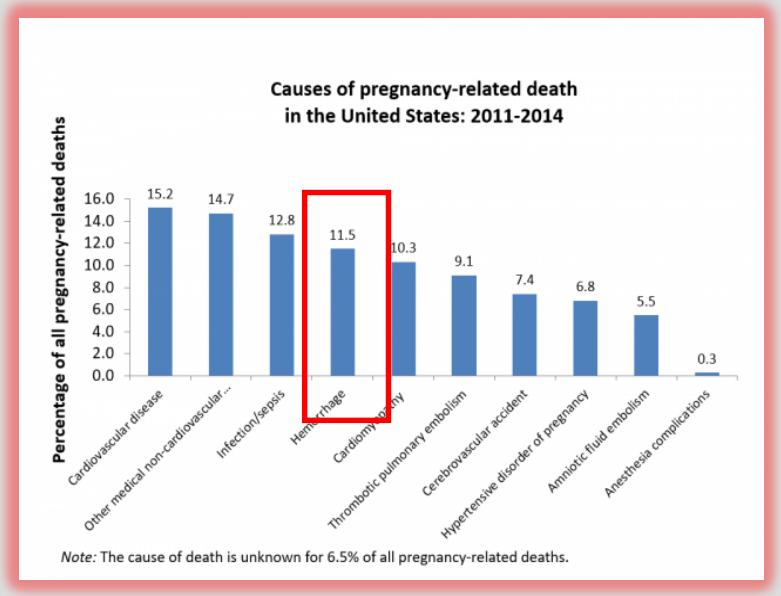




As the cesarean section rate increases (~33%), the VBAC remains low (10%)

MATERNAL MORTALITY IN THE US





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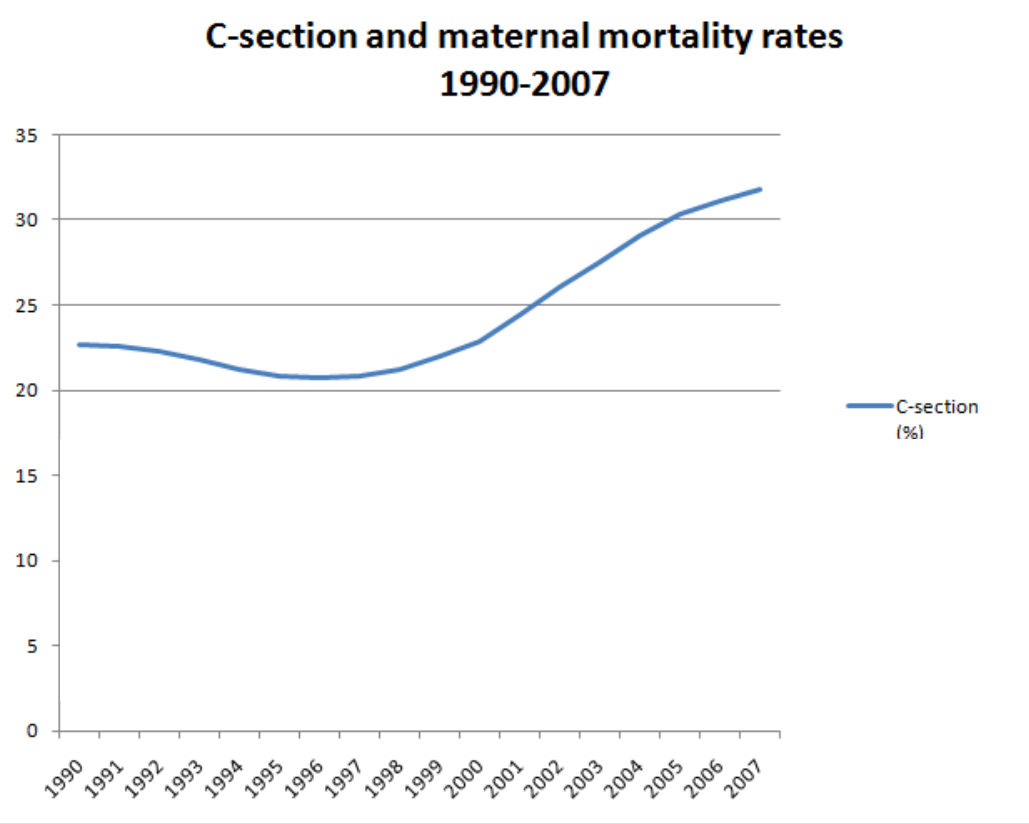
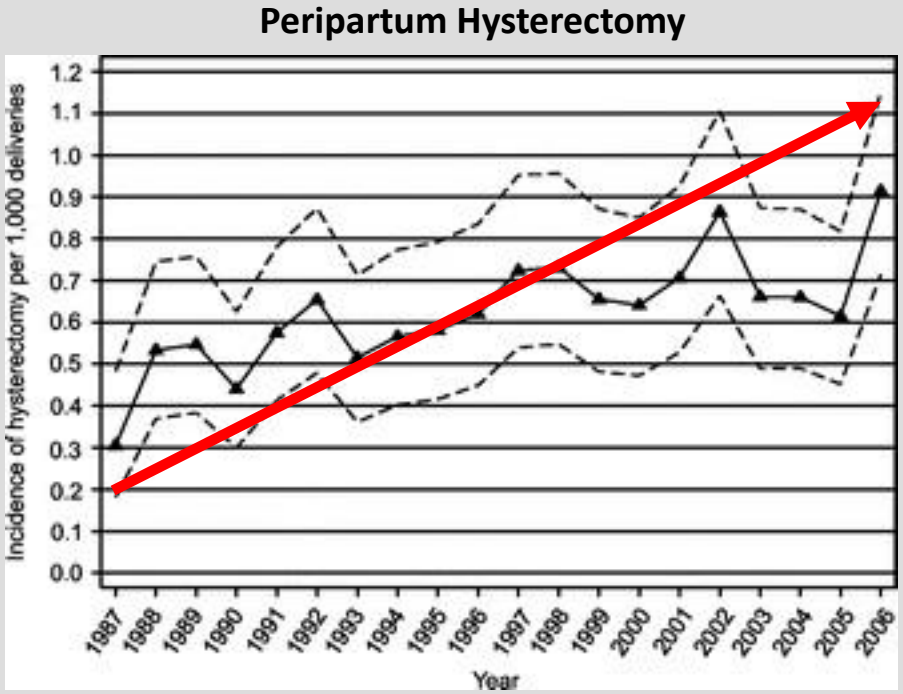
Creanga AA et al *Obstet Gynecol.*, 2017


C-section and maternal mortality rates
1990-2007
35
30
25
20
15
10
5
0
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
C-section (%)

US TRENDS



Washington state registry over 20 years

Risk factors:

Abnormal placentation	3 to 41-fold
Uterine Rupture	165-fold
Primary CD	4-fold
Repeat CD	8-fold
VBAC	2-fold
Chorioamnionitis	4-fold

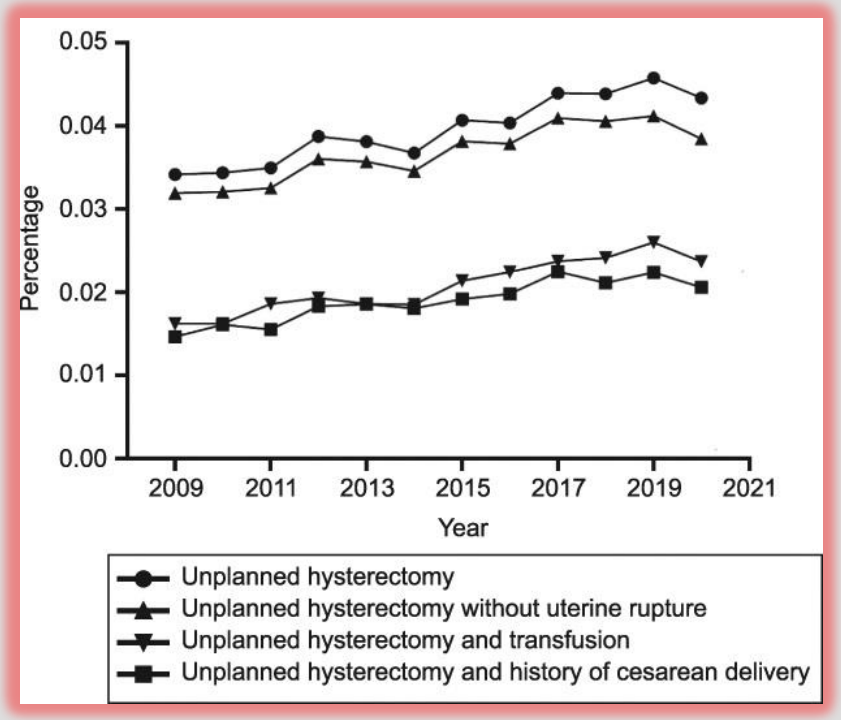
Risk factors (on re-admission):

Atony	3-fold
Infection	20-fold

Clara et al, Obstet Gynecol, 2009

US TRENDS- UNPLANNED

- National vital statistics + CDC WONDER data, 2009-2020
- Purpose of this study was to establish a national PAS incidence
- Increase in rate from 3.4 to 4.5 per 1000.
- Nationwide inpatient survey (NIS): shows an increase in PAS (maybe)



Givens et al, *Obstet Gynec*, 2022

ICD-10(?)

- ICD-10 included PAS
- Single center n=22,345 patients
- 104 (0.46%) had a PAS code (1:217)
- 56 (0.23%) had PAS histopathology (1:434)
- Most common reasons for miscoding were pre-operative or intra-operative concern

Reason for incorrect code assignment	*n*	%
Code assigned given evidence of PAS on antenatal imaging (despite the absence of intrapartum features concerning for PAS)	6	26.1
Code assigned given histologic evidence of occult placenta accreta	8	34.8
Code assigned despite an absence of antenatal or intrapartum features concerning for PAS	3	13.0
Code assigned given report of placental adherence at the time of delivery, did not meet FIGO Grade 1 criteria	4	17.4
Code assigned given clinical evidence of PAS meeting FIGO Grade 1 criteria	8	34.8
No reason identified	2	8.7

Jotwani et al, *Pediatric Perinat Epi*, 2024

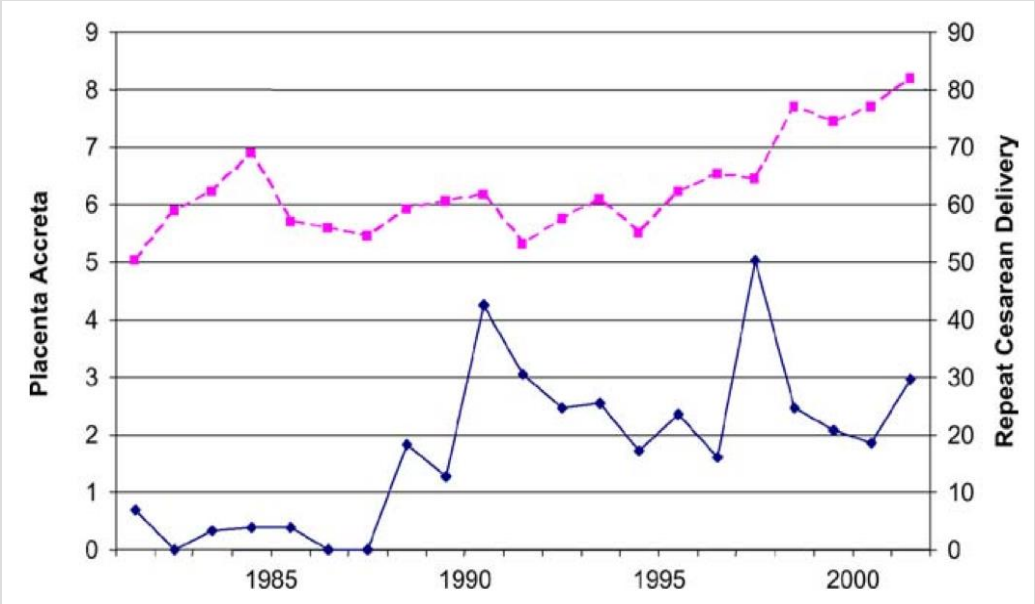
INCIDENCE

1970: 1:4027

1980: 1:2510

2000: 1:1500

Today: 1:250- 1:500

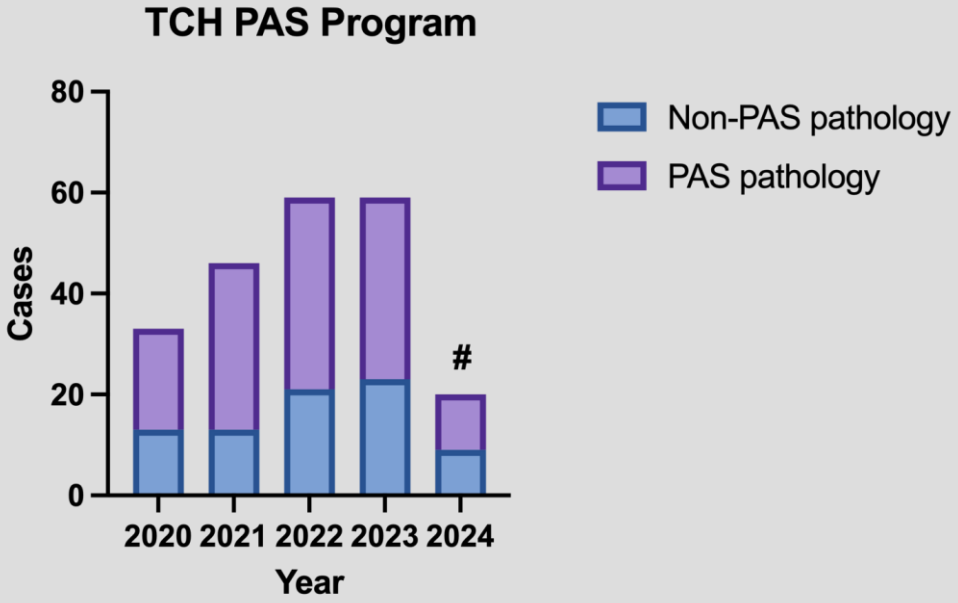


Maternal mortality reported as high as 7%.

Carusi, *Clin Obstet Gynecol*, 2018
Wu et al, *AJOG*, 2005

OUR INCIDENCE AT TCH

- Increasing incidence over recent years
- ~1 case/week
- **60-70%** of cases with confirmed PAS by histopathology

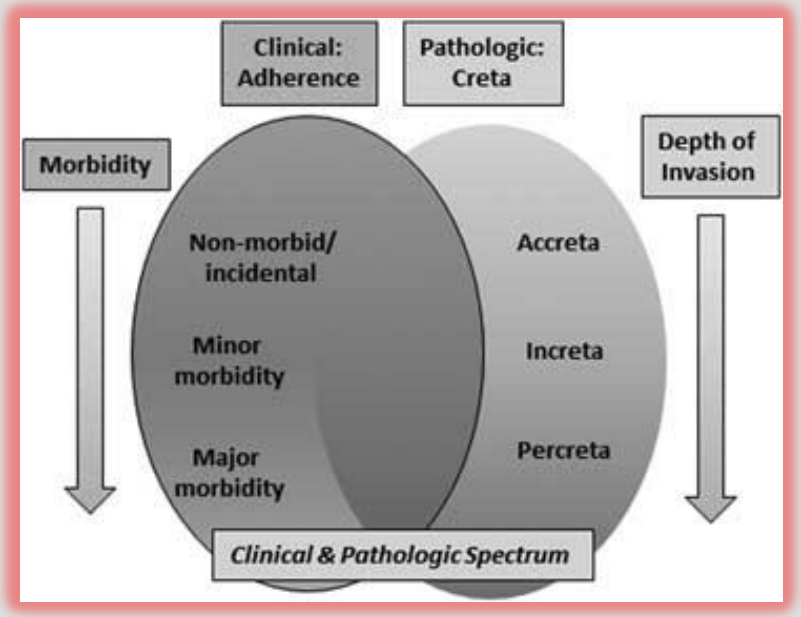


PLACENTA ACCRETA SPECTRUM: WHAT'S IN A NAME?

Accreta: clinical or pathologic diagnosis?

Focal, partial, complete?

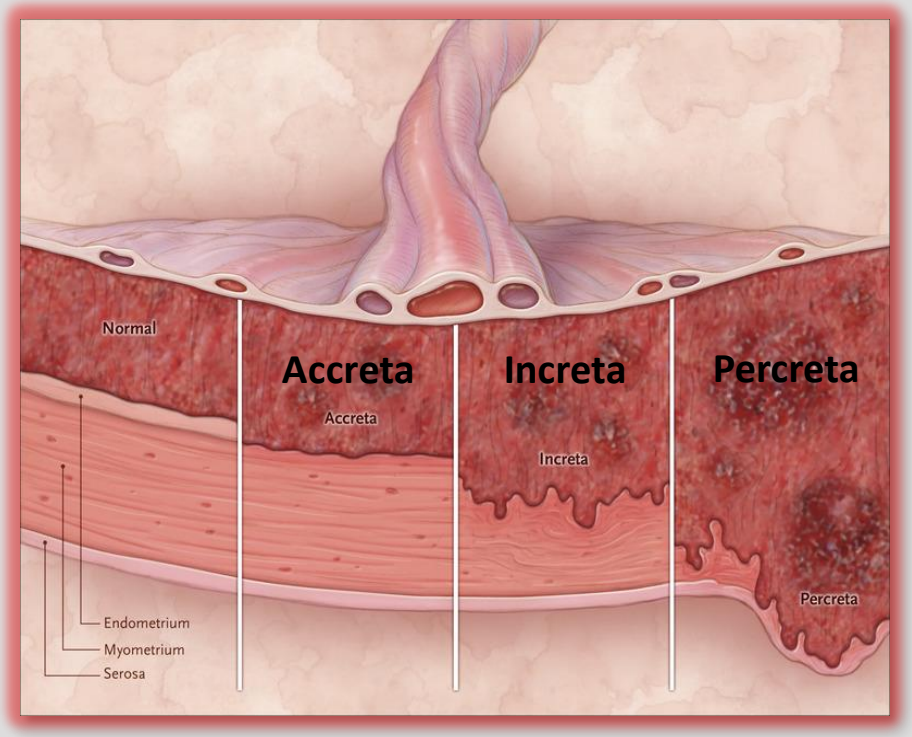
Morbidly adherent?



Carusi, *Clin Obste Gyn*, 2018

PLACENTA ACCRETA SPECTRUM (PAS)

- Abnormal adherence of the placental trophoblast to the uterine myometrium
- Placenta does not detach after delivery of fetus
- Significant maternal morbidity
- Prior cesarean section and placenta previa are known risk factors



Silver et al, NEJM, 2018

RISK FACTORS

Evidence-based:

-Placenta previa

-Prior cesarean section

-Prior history of PAS

-Prior uterine procedures

-IVF (frozen cycle)

Inconsistent evidence:

-AMA (>35YO)

-h/o D&C

-short interval pregnancy*

Anecdotal evidence:

-Uterine anomalies

-Irradiation

Carusi, *Clin Obstet Gynecol*, 2018
Wu et al, *AJOG*, 2005

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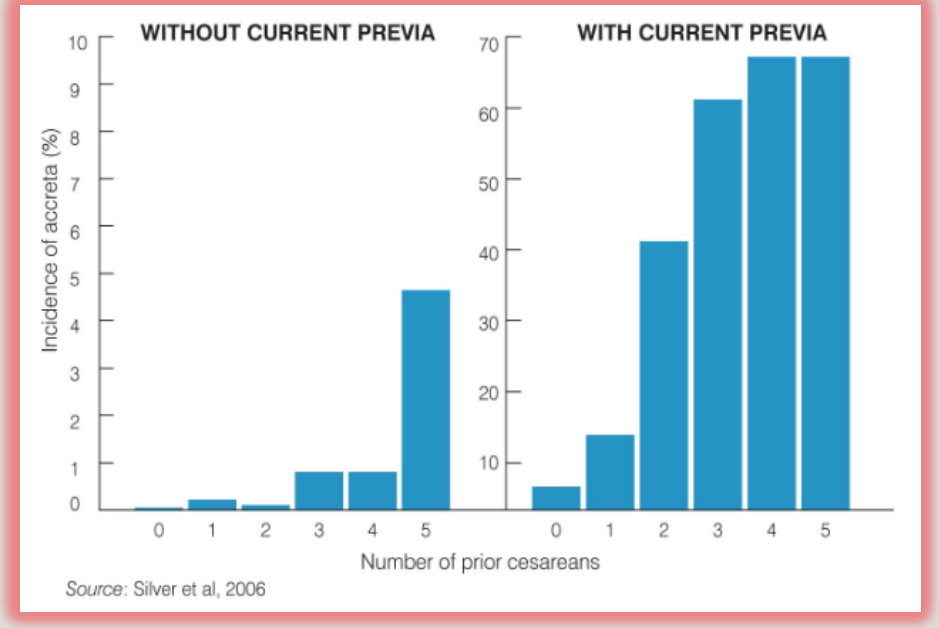
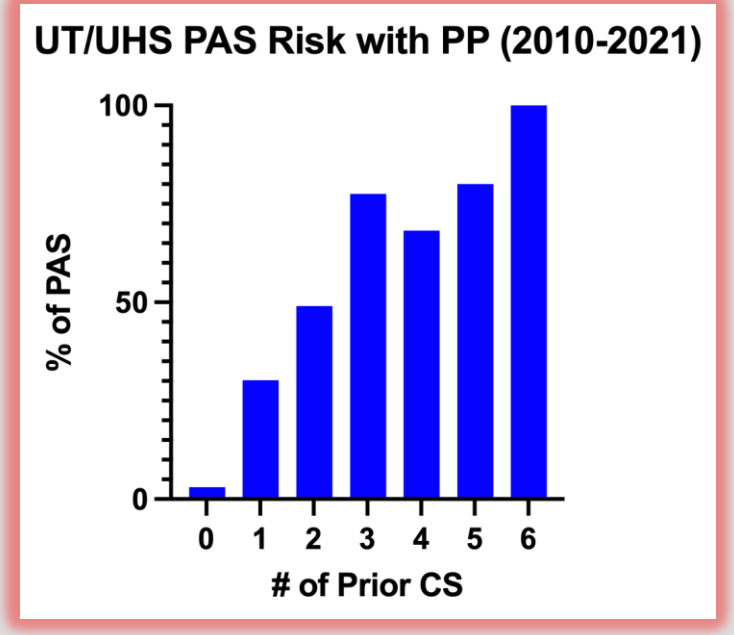
HISTORICAL RISK FACTORS





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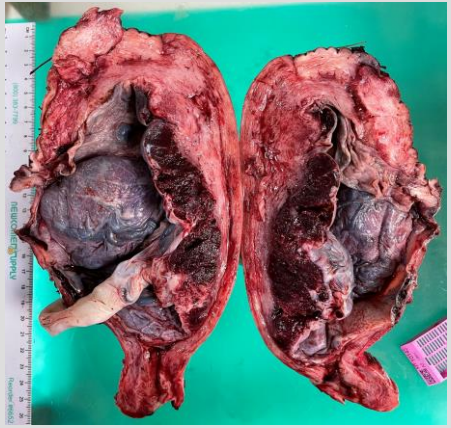
Silver et al, *Obstetric Gynecol*, 2006

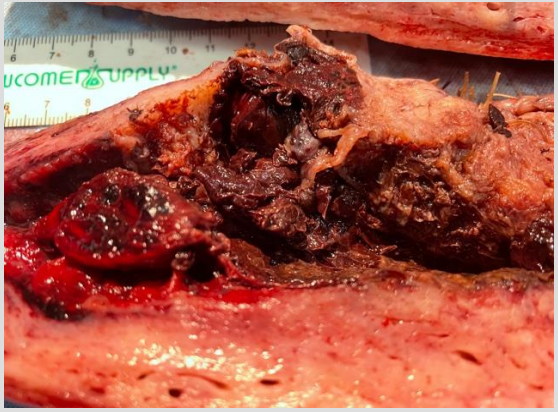
RISK FACTOR ASSESSMENT

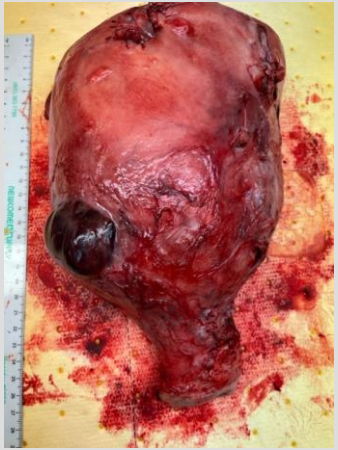
Risk factor	Odds ratio (95% CI)	*p* value
Prior cesarean deliveries (vs. 0)		< 0.001
1	2.86 (1.73–4.72)	< 0.001
2	4.61 (2.62–8.11)	< 0.001
≥ 3	12.57 (6.86–23.05)	< 0.001
Placenta previa	34.91 (22.42–54.34)	< 0.001

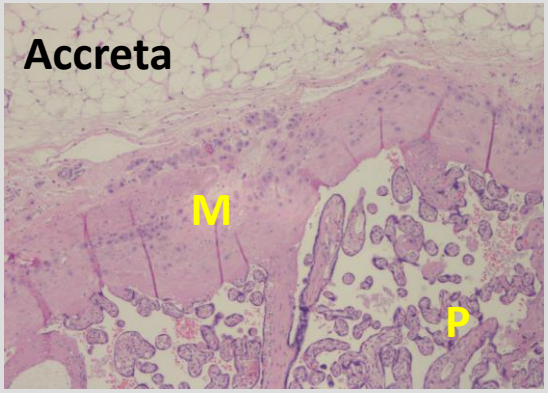
Models including 18 other variables did not improve this model

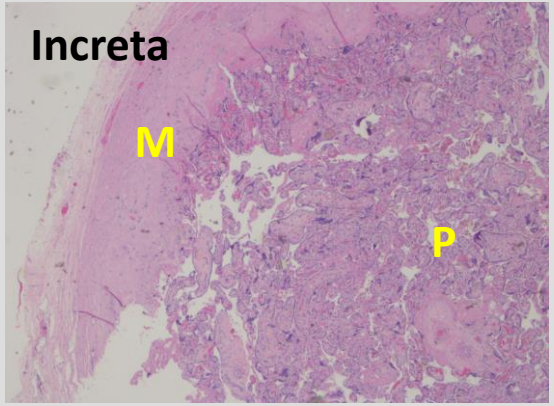
Bowman, *Am J of Perinatology*, 2013

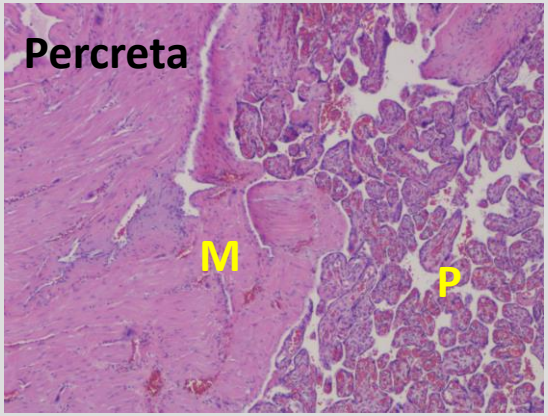












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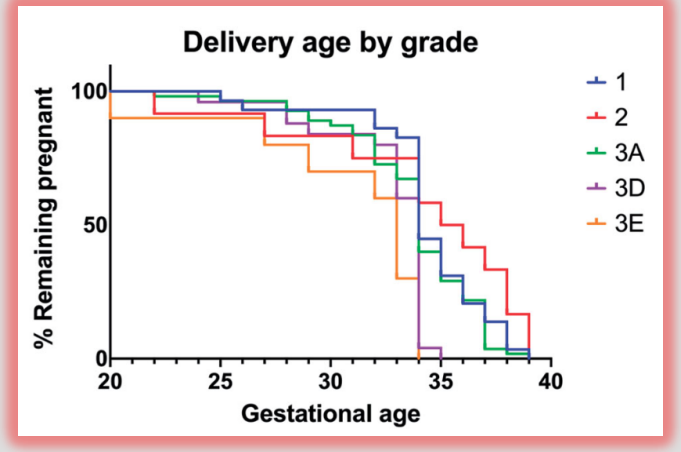
Images and slides courtesy of Dr. Phillip Valente

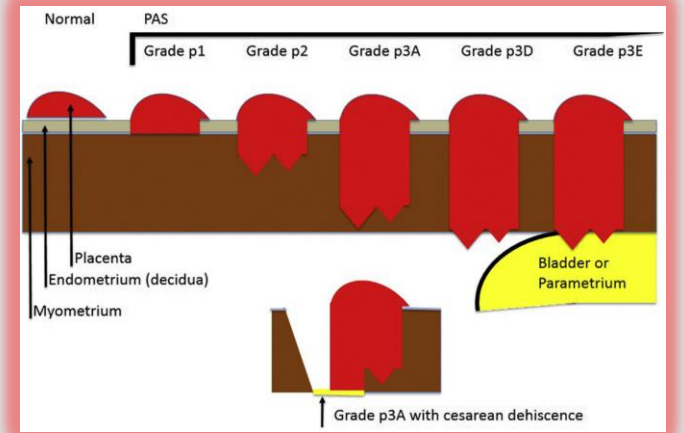
VALIDATION OF GUIDELINES



Variable	1 (n=28)	2 (n=12)	3A (n=50)	3D (n=25)	3E (n=10)	P-value
Vaginal bleeding >2	0 (0)	0 (0)	6 (12)	5 (20)	3 (30)	**0.03**
EBL >4L	3 (10.7)	2 (14.3)	15 (28.3)	13 (50)	7 (58.3)	**0.02**
Blood transfusion	15 (53.6)	8 (57.1)	41 (77)	22 (84.6)	11 (91.7)	**0.02**
ICU admission	9 (32.1)	5 (35.7)	19 (35.8)	16 (61.5)	9 (75)	**0.02**

Munoz et al, *J Mat Fetal Neo Med*, 2022

VALIDATION OF GUIDELINES



Variable	1 (n=92)	2 (n=74)	3A (n=84)	3D (n=121)	3E (n=36)	P-value
EBL (mean)	1725	1500	1800	1500	2700	0.72
# of RBC transfused	2 (0,3)	0 (0,3)	1.5 (0,3)	2 (0,5)	3.5 (1,7)	**0.03**
# of FFP transfused	0 (0,1)	0 (0,0)	0 (0,1)	0 (0,2)	2 (0,4)	**0.001**
Readmission	4 (4)	1 (1)	3 (4)	5 (4)	7 (19)	**0.001**

Salmanian et al, *AJOG*, 2022

MORBIDITY

Maternal ICU admission: 18 (26%)

Blood transfusion: 56 (82%)

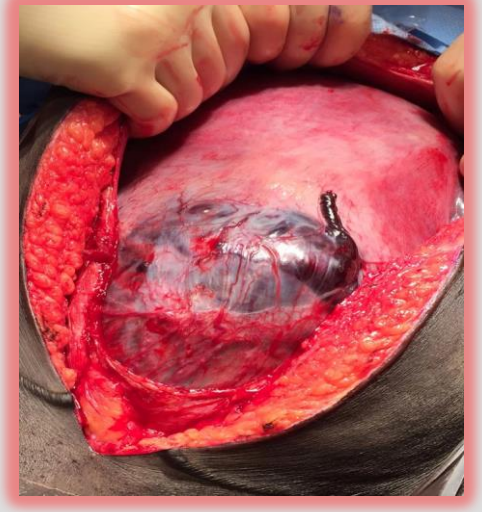
≥ 4 Unit blood transfusion: 27 (40%)

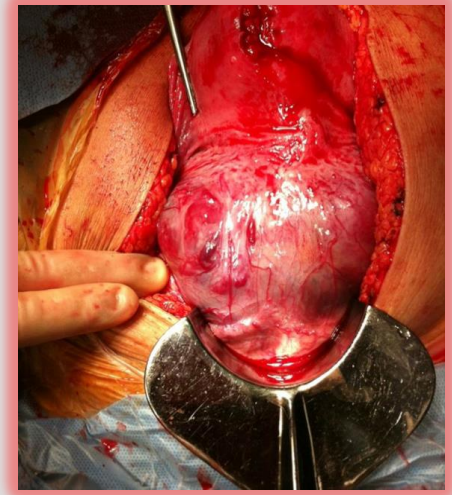
Coagulopathy: 20 (29%)

Ureteral injury: 3 (4%)

Infections: 18 (26%)

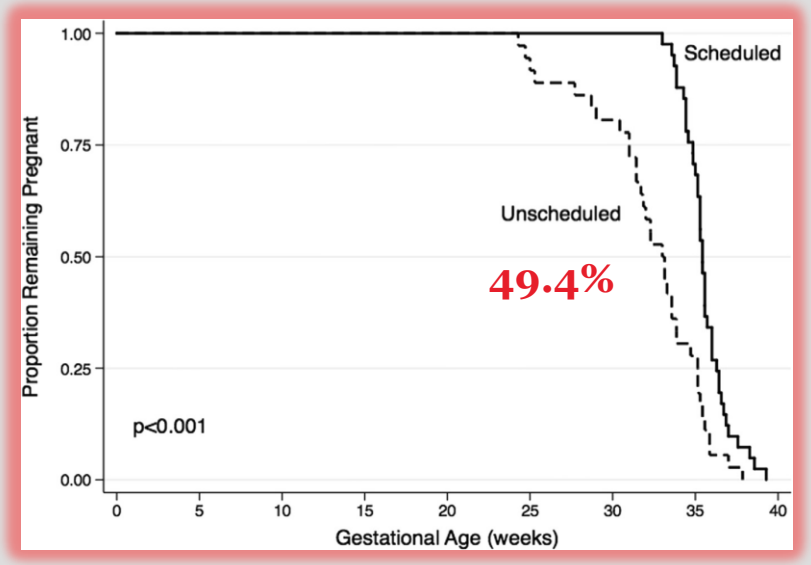
Reoperation: 6 (9%)

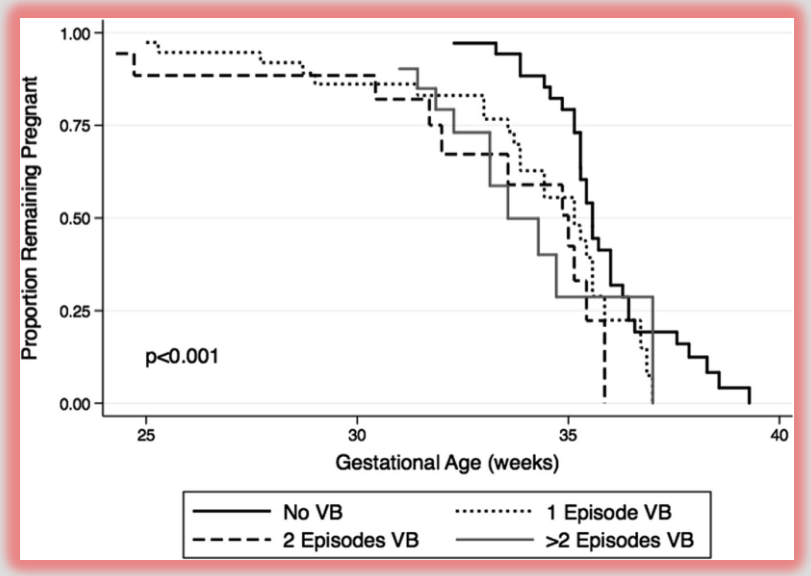




Eller et al, *Br J Obstet Gynecol,* 2009

UNSCHEDULED PAS DELIVERY





- **Vaginal bleeding** (86.8% vs 35.9%, *P* < .001)
- Risk of earlier delivery was greater when associated with **PPROM**

Bowman et al, *AJOG*, 2014

MFMU PERIPARTUM HYSTERECTOMY MORBIDITY

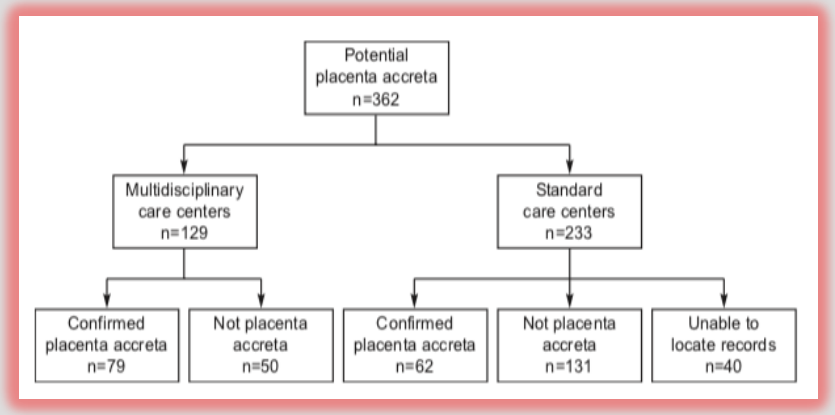
Morbidity	No Hysterectomy (%)	Hysterectomy (%)	*P*
Cystotomy	0.14	12.04	< .001
Ureteral injury	0.01	2.31	< .001
Pulmonary embolus	0.13	1.85	< .001
Ventilator	0.32	12.5	< .001
Intensive care unit	0.74	23.15	< .001
Reoperation	0.21	11.6	< .001
Endometritis	3.33	4.17	.50

Peripartum hysterectomy is NOT a benign intervention

Morbidity	No Accreta (%)	Accreta (%)	*P*
Cystotomy	0.15	15.4	< .001
Ureteral injury	0.02	2.1	< .001
Pulmonary embolus	0.13	2.1	.001
Ventilator	0.3	14	< .001
Intensive care unit	0.8	26.6	< .001
Reoperation	0.26	5.6	< .001
Endometritis	3.34	3.50	.81

Peripartum hysterectomy for PAS is even more complicated

PAS CENTERS OF EXCELLENCE



Variable	Multidisciplinary Center (n=79)	Standard Care Center (n=62)	P-value
Scheduled delivery	30 (38)	25 (40.3)	-
Reoperation	2 (3)	16 (36)	**<0.001**
Transfusion >4 units	34 (43)	38 (61)	**0.031**

80% overall risk reduction.

Eller et al, *Obstetrics and Gynecology*, 2011

SUMMARY

- Understanding the true incidence of PAS is a complicated goal with areas of improvement
- It would appear PAS incidence has increased over time
- As such, maternal morbidity and mortality associated to PAS has increased
- Efforts to standardize PAS nomenclature reflect associated morbidity
- Morbidity may be decreased with interdisciplinary care teams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COMMENTS/QUESTIONS?