CHIU YEE LIONA POON

A/PROF., M.D.,

Faculty of Medicine

The Chinese University of Hong Kong

VIETNAM – FRANCE – ASIA – PACIFIC
CONFERENCE ON OBSTETRICS AND GYNECOLOGY
Ho Chi Minh City, May 19th - 20th, 2016

16th

Prediction for a Successful Induction of Labour

Liona Poon

Clinical Associate Professor

MBBS MRCOG MD(Res)

香港中文大學醫學院

Faculty of Medicine

The Chinese University of Hong Kong

Pre-induction cervical length

Prediction of vaginal delivery

Induction of labour at 35^{+0} - 42^{+6} wks

Cervical length in mm

Maternal factors:

- Parity
- Maternal age
- BMI
- Gestational age

822 singleton pregnancies

Prolonged pregnancy (n=370)
Hypertension (n=105)
SGA / LGA (n=131)
Maternal disease (n=62)
Prelabour ROM (n=58)
Maternal request (n=50)
Past obstetric Hx (n=24)
APH (n=22)

Vaginal delivery within 24h in 530 (64.5%)

CS within 24h for fetal distress in 54 & FTP in 28 (10.0%)

CS for fetal distress in 70 & FTP in 91 (19.6%)

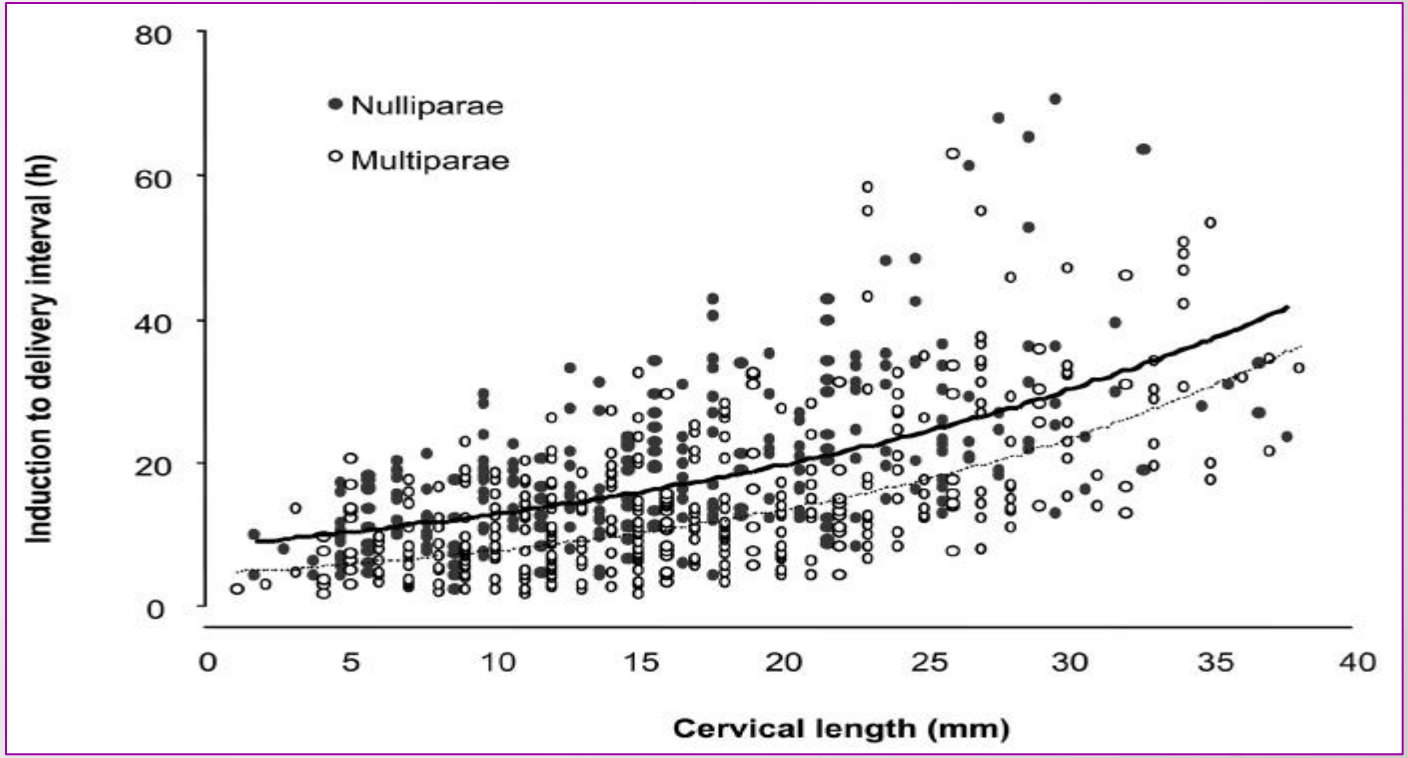
Aims - To examine the effect of gestational age, BMI, maternal age, pre-induction cervical length and parity on:

1. The induction-to-delivery interval
2. The likelihood of vaginal delivery within 24 hours
3. The risk for CS

Rane et al, 2005

Pre-induction cervical length

Induction-to-delivery interval



Pre-induction cervical length

Prediction models

Outcome	Induction-to-delivery interval in 24h Hazard ratio (95% CI)	Vaginal delivery in 24h Odds ratio (95% CI)	Caesarean section for FTP Odds ratio (95% CI)
Cervical length	0.89 (0.88-0.90)	0.86 (0.84-0.88)	1.11 (1.07-1.14)
Parity			
Nullip	1.00	1.00	1.00
Multip	2.39 (1.98-2.88)	3.59 (2.47-5.22)	0.26 (0.15-0.43)
GA	1.13 (1.07-1.20)	1.19 (1.07-1.32)	0.83 (0.73-0.96)
BMI			
< 30			1.00
≥ 30			2.07 (1.27-3.37)
Age			1.05 (1.00-1.09)
Birthweight	0.995 (0.99-0.998)		

Pre-induction cervical length

Prediction of post-term vaginal delivery

Prolonged pregnancy clinic at 40^{+4} - 41^{+6} wks

Fetal presentation/lie
Estimated fetal weight
Amniotic fluid volume
Umbilical artery Doppler
Cervical length in mm

2,316 singleton pregnancies

Induction of labour in <7 d
452 (19.5%)
Medical indications (n=87)
Maternal request (n=340)

1,864

Spontaneous labour <10d in 1,536 (82.4%)
Induction of labour in 7-10d in 328 (17.6%)

Aims - to predict the probability of :
1. Spontaneous onset of labour within subsequent 10 days
2. Vaginal delivery after spontaneous or induced labor

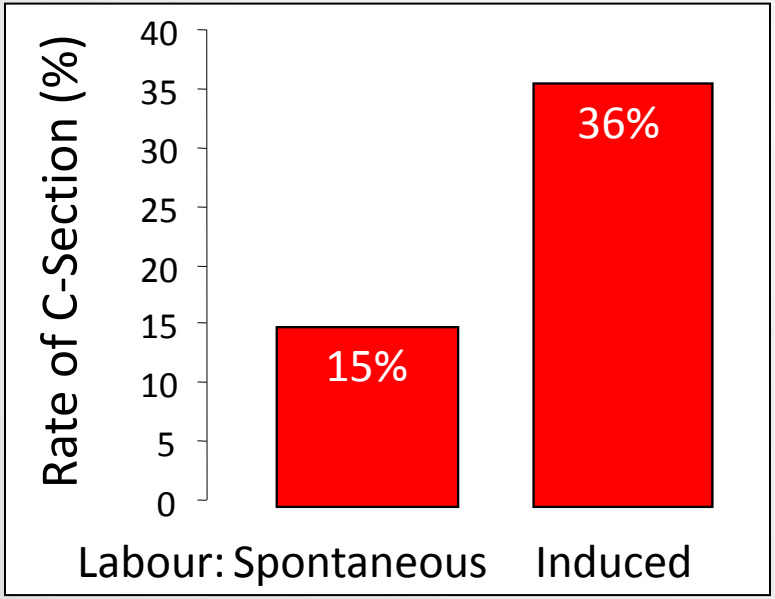
Rai et al, 2008

Pre-induction cervical length

Labour & delivery

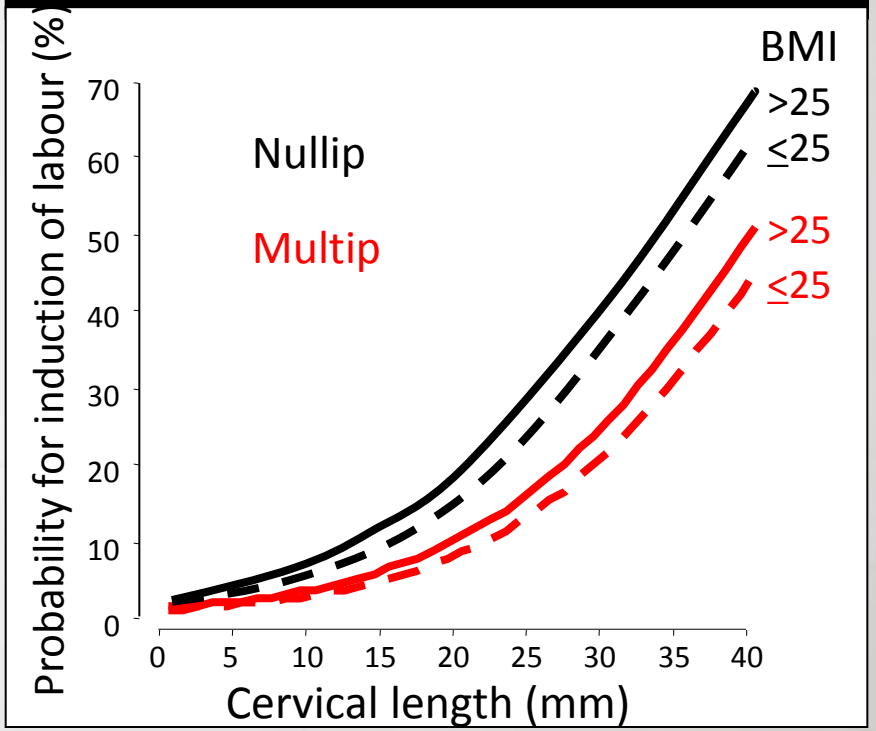
Spontaneous labour <10d in 82.4%

Induction of labour in 7-10d in 17.6%



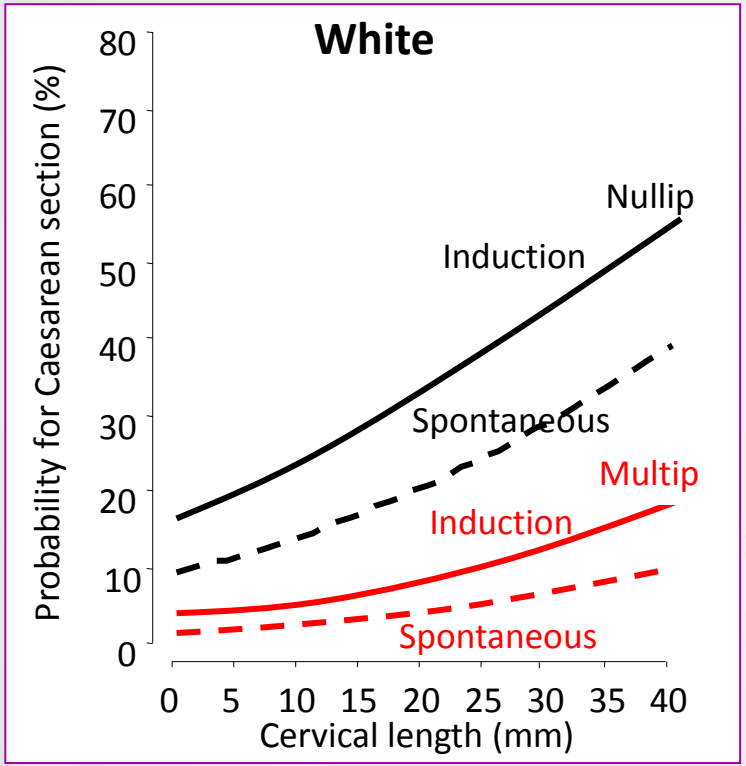
香港中文大學醫學院
Faculty of Medicine
The Chinese University of Hong Kong

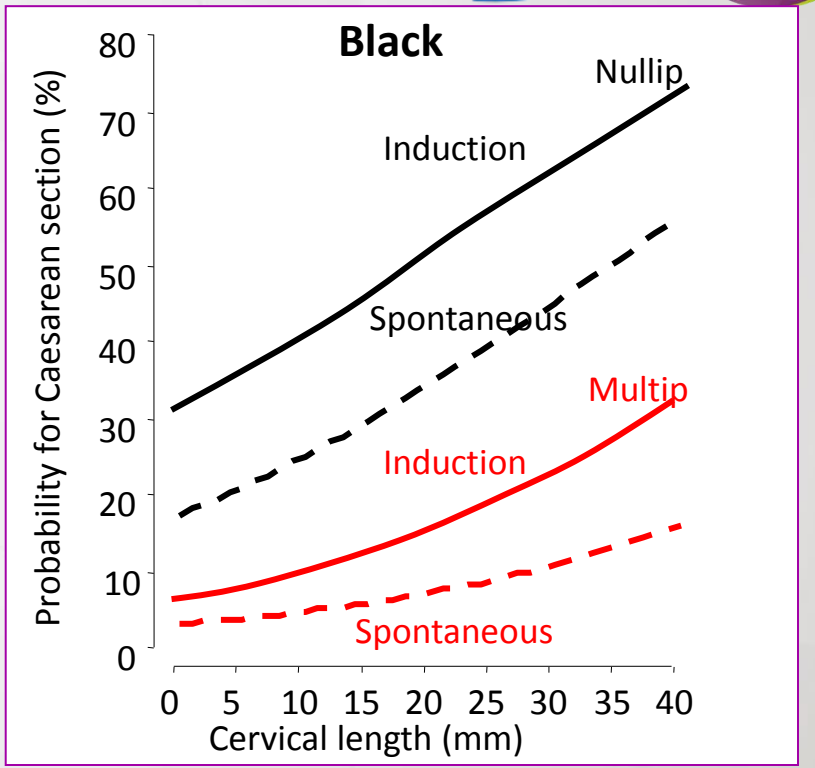
Need for Induction



Pre-induction cervical length

Prediction of CS





Spontaneous labour 80%

Short Cx, Multip, Thin

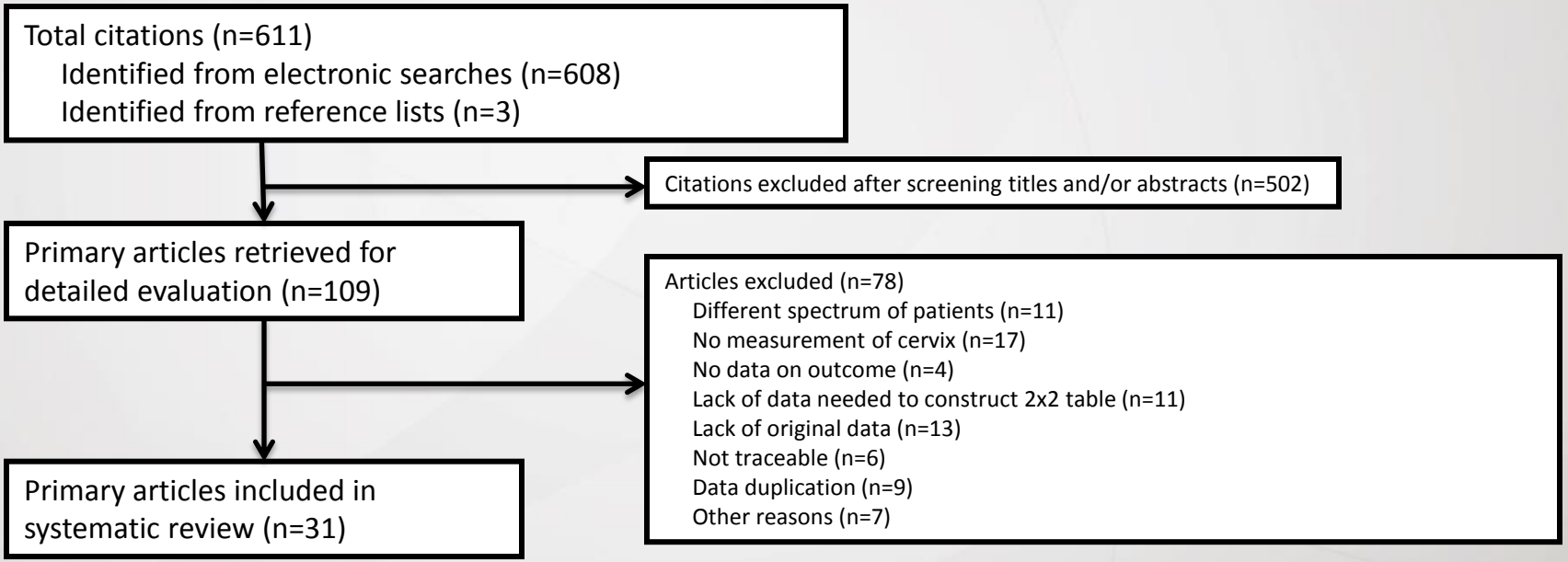
Caesarean section rate 20%

Long Cx, induced labour,
Black, Nullip, Obese

Pre-induction cervical length

Prediction of IOL

To perform a systematic review & meta-analysis to assess the predictive capacity of cervical length for the outcome of IOL



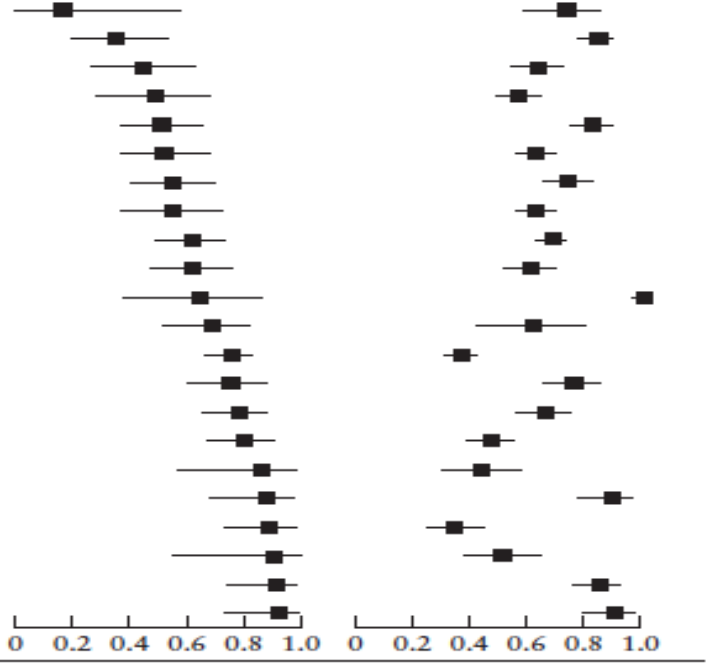
香港中文大學醫學院
Faculty of Medicine
The Chinese University of Hong Kong

Verhoeven et al, 2013

Pre-induction cervical length

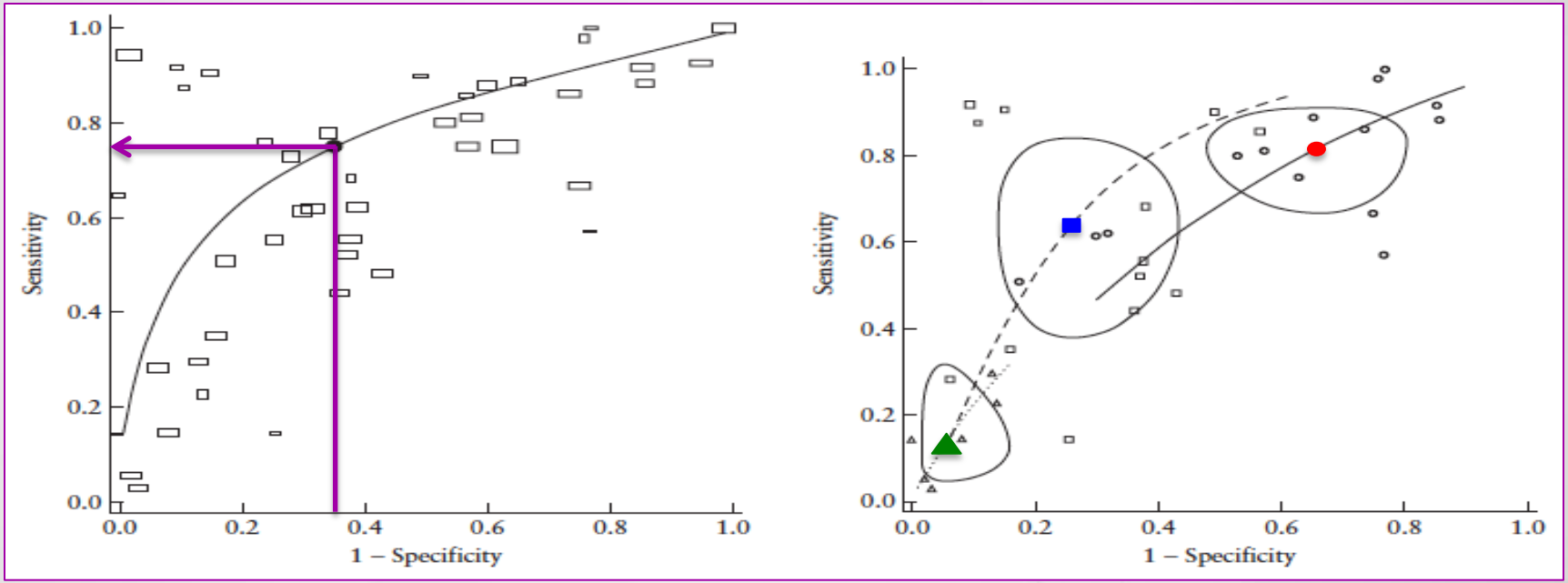
Prediction of CS

Study	TP	FP	FN	TN	Sensitivity	Specificity
Paterson-Brown[17] (1991)	1	11	6	32	0.14 (0.00–0.58)	0.74 (0.59–0.86)
Meijer-Hoogeveen[39] (2009)	13	30	24	158	0.35 (0.20–0.53)	0.84 (0.78–0.89)
Park[43] (2007)	15	46	19	81	0.44 (0.27–0.62)	0.64 (0.55–0.72)
Verhoeven[48] (2009)	13	92	14	121	0.48 (0.29–0.68)	0.57 (0.50–0.64)
Bastani[26] (2011)	29	25	28	18	0.51 (0.37–0.64)	0.83 (0.75–0.88)
Rozenberg[22] (2005)	25	81	23	137	0.52 (0.37–0.67)	0.63 (0.56–0.69)
Cromi[30] (2007)	27	27	22	79	0.55 (0.40–0.69)	0.75 (0.65–0.82)
Eggebo[33] (2008)	20	90	16	149	0.56 (0.38–0.72)	0.62 (0.56–0.69)
Rane[44] (2003)	44	99	27	212	0.62 (0.50–0.73)	0.68 (0.63–0.73)
Gabriel[19] (2002)	33	49	20	77	0.62 (0.48–0.75)	0.61 (0.52–0.70)
Elghorori[34] (2006)	11	0	6	87	0.65 (0.38–0.86)	1.00 (0.96–1.00)
Yanik[51] (2007)	30	11	14	18	0.68 (0.52–0.81)	0.62 (0.42–0.79)
Cheung[29] (2010)	90	214	30	126	0.75 (0.66–0.82)	0.37 (0.32–0.42)
Daskalakis[31] (2006)	34	22	11	70	0.76 (0.60–0.87)	0.76 (0.56–0.84)
Gómez Laencina[38] (2007)	49	39	14	75	0.78 (0.66–0.87)	0.66 (0.56–0.74)
Tan[46] (2007)	44	103	11	91	0.80 (0.67–0.90)	0.47 (0.40–0.54)
Caliskan[28] (2006)	12	34	2	26	0.86 (0.57–0.98)	0.43 (0.31–0.57)
Mohamed[40] (2000)	21	6	3	50	0.88 (0.68–0.97)	0.89 (0.78–0.96)
Gabriel[35] (2001)	32	64	4	34	0.89 (0.74–0.97)	0.35 (0.25–0.45)
Dewandeleer[32] (1998)	9	32	1	33	0.90 (0.55–1.00)	0.51 (0.38–0.63)
Keepanasseril[37] (2007)	29	16	3	90	0.91 (0.75–0.98)	0.85 (0.77–0.91)
Ware[49] (2000)	22	5	2	48	0.92 (0.73–0.99)	0.91 (0.79–0.97)



Pre-induction cervical length

Prediction of CS



Cx 20 mm: DR 82% FPR 66% LR+ 1.2 LR- 0.53

Cx 30 mm: DR 64% FPR 26% LR+ 2.5 LR- 0.49

Cx 40 mm: DR 13% FPR 5% LR+ 2.6 LR- 0.92

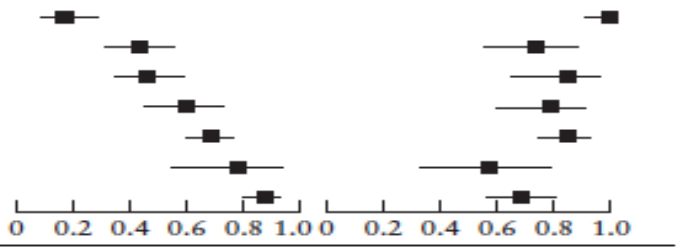
香港中文大學醫學院
Faculty of Medicine
The Chinese University of Hong Kong

Pre-induction cervical length

Prediction of labour & delivery

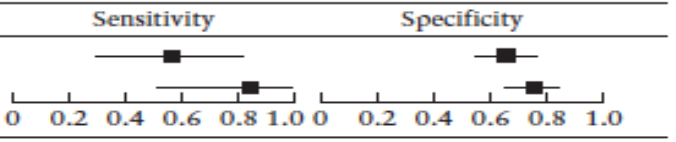
No vaginal delivery within 24h

Study	TP	FP	FN	TN	Sensitivity	Specificity
Bueno[27] (2005)	11	1	55	63	0.17 (0.09–0.28)	0.98 (0.92–1.00)
Reis[21] (2003)	33	9	44	25	0.43 (0.32–0.55)	0.74 (0.56–0.87)
Novakov-Mikic[41] (2000)	34	4	40	22	0.46 (0.34–0.58)	0.85 (0.65–0.96)
Gonen[36] (1998)	32	7	22	25	0.59 (0.45–0.72)	0.78 (0.60–0.91)
Pandis[18] (2001)	97	12	146	66	0.68 (0.60–0.75)	0.58 (0.75–0.92)
Tanir[47] (2008)	17	9	5	12	0.77 (0.55–0.92)	0.57 (0.34–0.78)
Pandis[42] (2001)	111	21	17	46	0.87 (0.80–0.92)	0.69 (0.56–0.79)



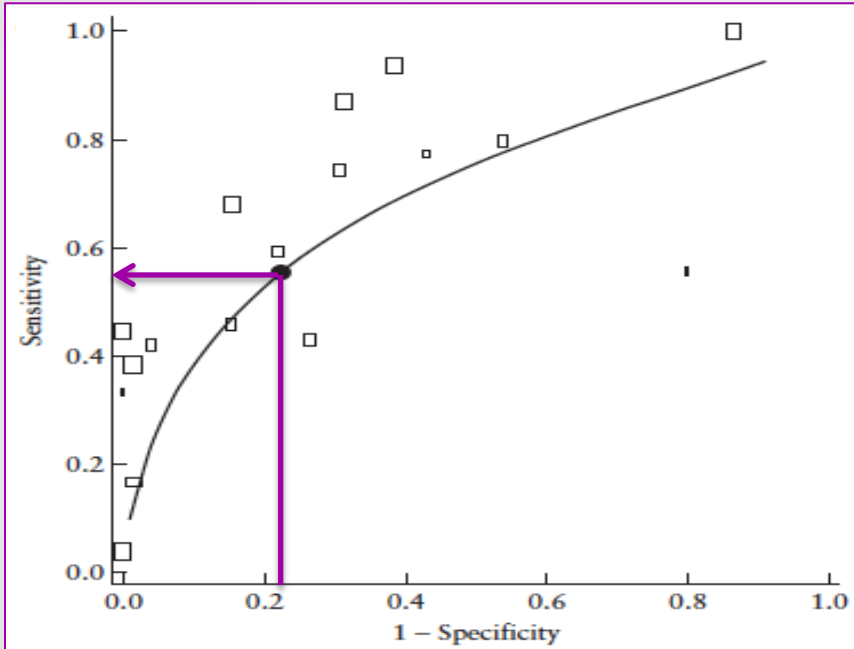
Not achieving active labour

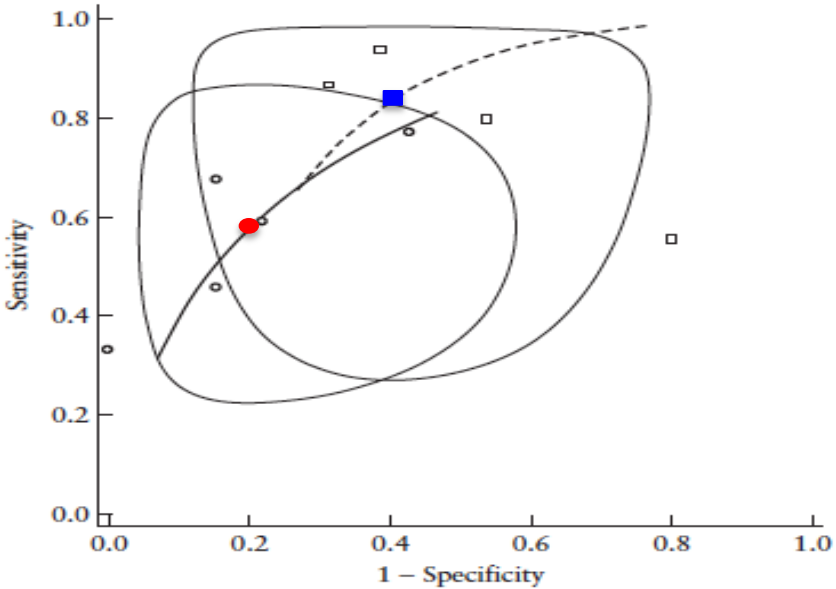
Study	TP	FP	FN	TN	Sensitivity	Specificity
Roman[45] (2004)	9	31	7	59	0.56 (0.30–0.80)	0.66 (0.55–0.75)
Yang[50] (2004)	10	23	2	70	0.83 (0.52–0.98)	0.75 (0.65–0.84)



Pre-induction cervical length

Prediction of no vaginal delivery





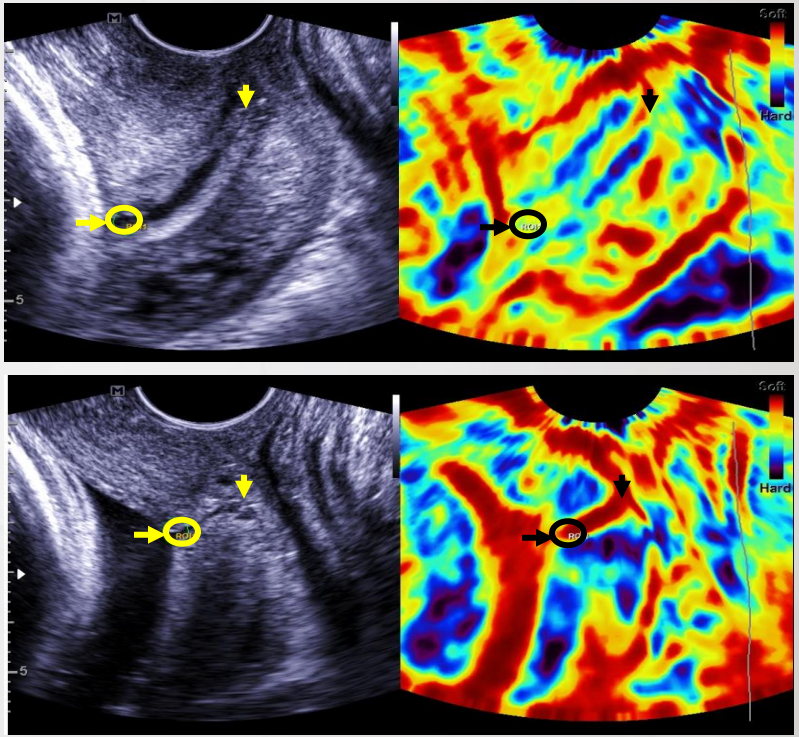
Cx 25 mm: DR 58% FPR 20% LR+ 2.9 LR- 0.53

Cx 32 mm: DR 84% FPR 40% LR+ 2.1 LR- 0.27

Pre-induction elastography

Prediction of successful IOL

	Failed IOL	Successful IOL
Swiatkowska-Freund 2011		
	n=16	n=13
Elastography index		
Internal os	0.39	1.23 *
Cervical canal	1.17	1.13
External os	111	1.00
Fruscalzo 2015		
	n=4	n=73
Cervical tissue strain	0.6	0.8 *



Pre-induction AOP

Prediction of vaginal delivery

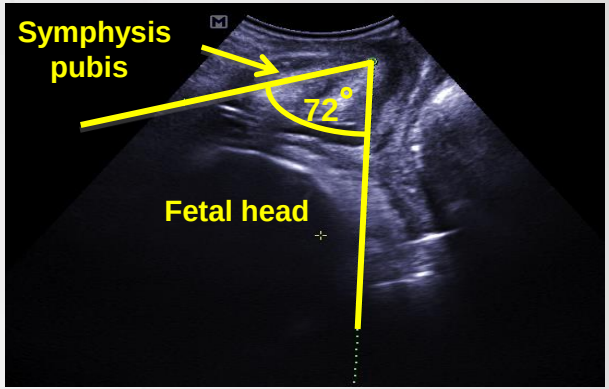
AOP provides a sonographic measure of head station

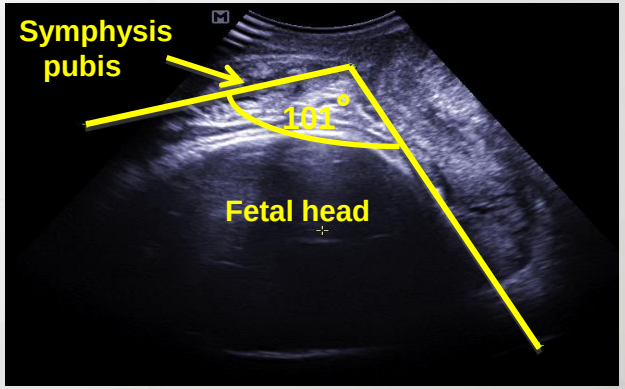
Several studies in labouring women reported a wide angle indicates a good chance of vaginal delivery

AOP measured in 100 nullip and 71 multip non-labouring women at 39-42 wks:

- In women who delivered vaginally (n=161), multip had a narrower AOP than nullip (98° vs 104°)
- In nullip, median AOP was narrower in those who went on to deliver by CS (90° vs 104°); an AOP ≥95° is associated with vaginal delivery in 99% and 89% of women who delivered by CS had an AOP <95◦

Levy et al, 2012





Pre-induction AOP & elastography

Prediction of vaginal delivery

Induction of labour at 35^{+0} - 42^{+6} wks

Cervical length in mm

Elastographic score

Angle of progression

Maternal factors

99 singleton pregnancies

Prolonged pregnancy (n=56)
Hypertension (n=17)
Diabetes (n=16)
Other (n=10)

Vaginal delivery in 66 (66.7%)

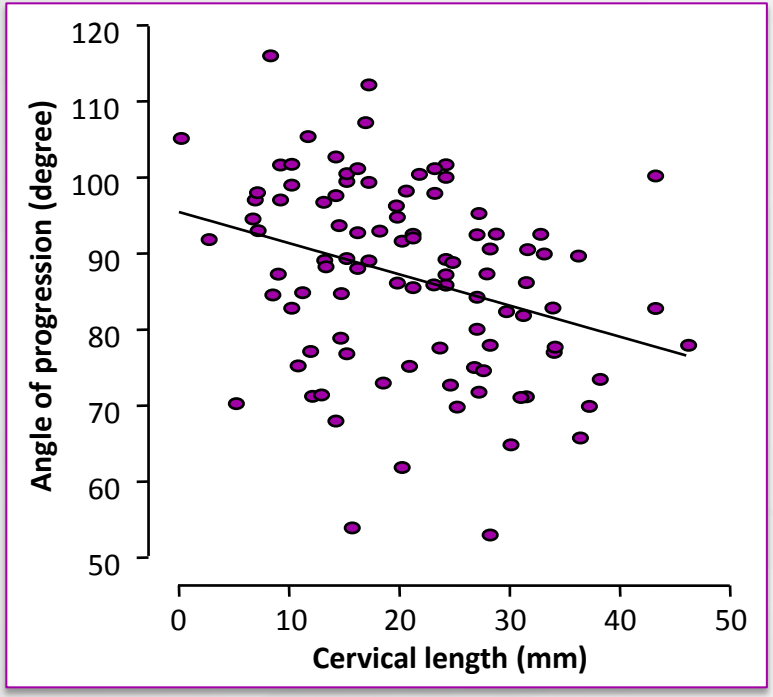
CS in 33 (33.3%)

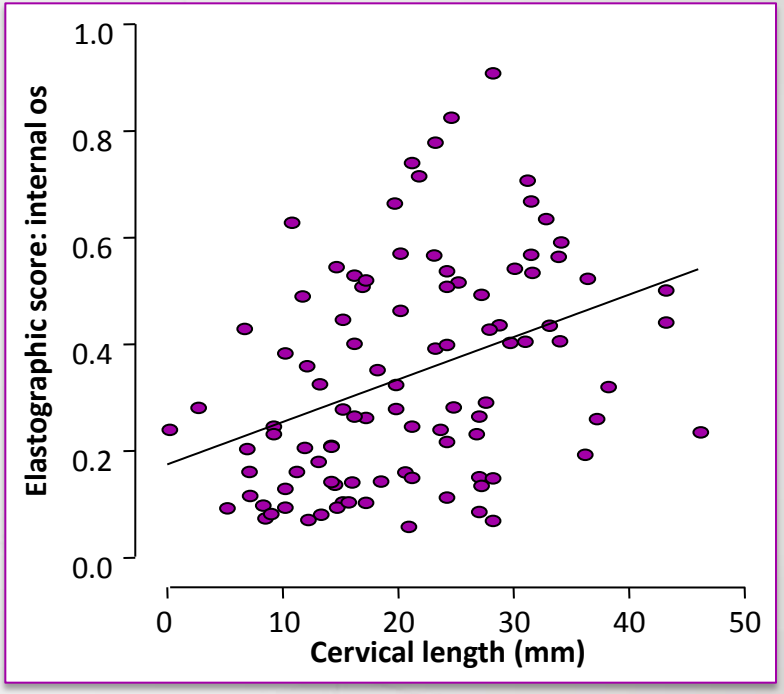
Aim - To examine the potential value of pre-induction cervical length, cervical elastography and angle of progression in prediction of successful vaginal delivery & induction-to-delivery interval

Pereira et al, 2014

Pre-induction AOP & elastography

Relation with cervical length





- Significant correlation with cervical length
- AOP & elastography do not provide additional prediction for vaginal delivery

香港中文大學醫學院
Faculty of Medicine
The Chinese University of Hong Kong

Pre-induction cervical score

Prediction of IOL

Induction of labour at 37^{+0} - 42^{+6} wks

Bishop score

Cervical score

131 singleton pregnancies

24 patients excluded for previous CS, APH and CPD etc

Active labour in 93 (86.9%)

- 86 had vaginal delivery
- 7 had CS (5 for FTP, 2 for fetal distress)

CS in 14 for failed IOL (13.1%)

Aims - To evaluate the role of pre-induction transvaginal sonographic cervical score in predicting labour outcome

To compare its performance against Bishop score in women undergoing IOL

Bajpai et al, 2015

Bishop score vs cervical score

Prediction of IOL

Modified Bishop score

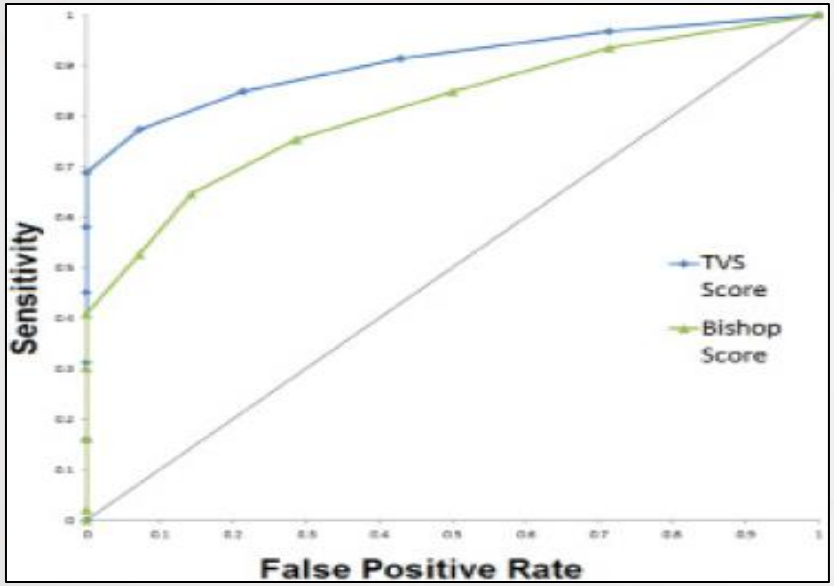
Score	0	1	2
Dilatation of cervix	< 1 cm	1- 2 cm	>1 cm
Cervical length	>2 cm	1- 2 cm	< 1 cm
Position of cervix	Posterior	Mid	Anterior
Consistency of cervix	Firm	Soft	Soft and stretchable
Station of Head	≥ -2	-1	≥0

Cervical score

Score	0	1	2
Cervical length	>3 cm	2-3 cm	< 2 cm
Funnel length	Absent	≤ 0.5 cm	>0.5 cm
Funnel width	Absent	≤ 0.5 cm	>0.5 cm
Position of cervix	Curved	-	Straight
Distance of presenting part to external os	>3 cm	2-3 cm	< 2cm

Bishop score vs cervical score

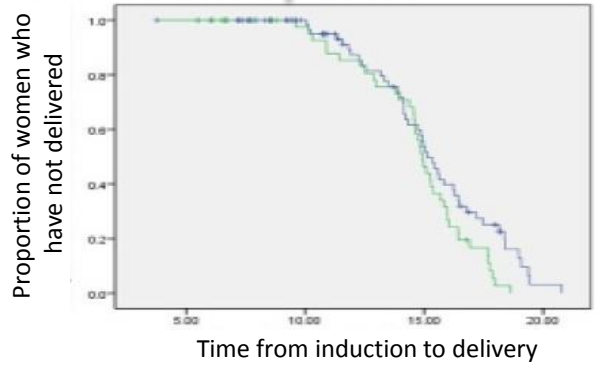
Prediction of active labour & vaginal delivery



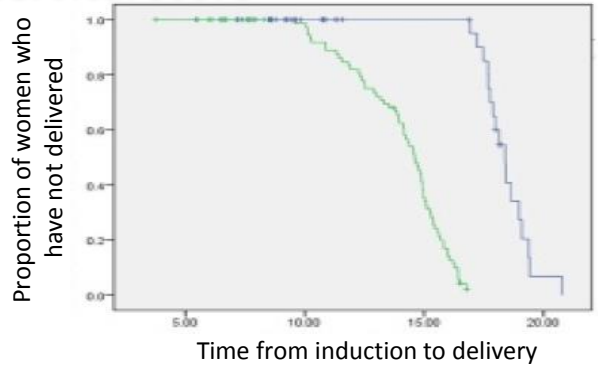
Scoring methods	DR (%)	FPR (%)	LR+	LR-	AUC
Bishop score >4	64.5	14.3	4.5	0.4	0.815
Cervical score >4	77.4	7.1	10.8	0.2	0.907

香港中文大學醫學院
Faculty of Medicine
The Chinese University of Hong Kong

Modified Bishop score



Cervical score



Conclusions

- Cervical length assessment has moderate capacity to predict outcome of delivery after IOL
- Cervical score assessment is superior to the Bishop score in predicting labour outcome
- Cervical elastography and AOP have limited clinical utility in predicting a successful IOL

Thank you