

## Comparison of 12-hour Urine and Protein: Creatinine Ratio to 24-hour Urine for the Diagnosis of Preeclampsia (Poster)

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# Comparison of 12-hour Urine and Protein:Creatinine Ratio to 24-hour Urine for the Diagnosis of Preeclampsia

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## Abstract

**OBJECTIVE:** The standard threshold value of proteinuria in the setting of hypertension for the diagnosis of preeclampsia is a 24-hour urine protein (24-hr)  $\geq$  300mg. Equivalent values have been generated for more convenient and/or cost-effective tests, such as the 12-hour urine protein (12-hr) and protein:creatinine ratio (PCR), but these have not been tested prospectively. The purpose was to compare the performance of the 12-hr and PCR to a standard 24-hr  $\geq$  300mg for the diagnosis of preeclampsia.

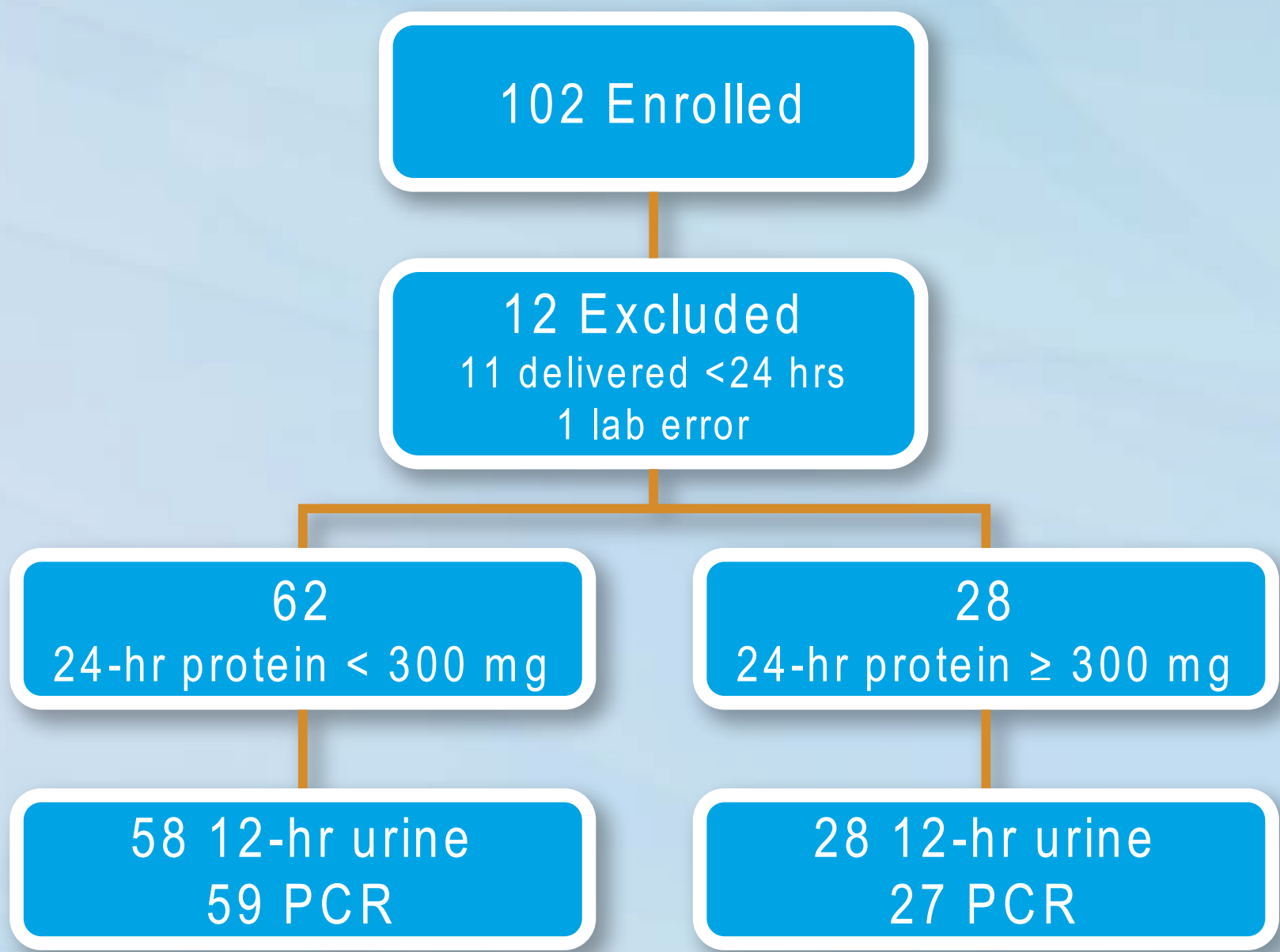
**STUDY DESIGN:** This was a prospective observational study of women admitted to the Lehigh Valley Health Network from 7/1/2010 to 12/31/2011 for diagnosis and/or management of preeclampsia. For each patient, PCR, 12-hr and 24-hr urine specimens were collected. Only the 24-hr result was used for clinical management. Test characteristics for identifying 24-hr  $\geq$  300mg were calculated. Cutoff values were based on previously published data.

**RESULTS:** A total of 102 patients were enrolled during the study period, 12 of which were subsequently excluded (11 delivered prior to completion, 1 was excluded due to lab error) for a final cohort of 90 patients. Twenty-eight (31%) of the final cohort had 24-hr  $\geq$  300mg. Both 12-hr  $>$  165mg and PCR  $>$  0.15 correlate significantly with 24-hr  $\geq$  300mg ( $r=0.99$ ,  $p<0.001$  and  $r=0.54$ ,  $p<0.001$ , respectively). Test characteristics for 12-hr  $>$  165mg and PCR  $>$  0.15 are shown in Table 3.

**CONCLUSION:** 12-hr  $>$  165mg performed well as a predictor of 24-hr  $\geq$  300mg, with the benefit of a shorter evaluation time. The high negative predictive value of PCR suggests that it may be most useful in identifying patients that do not have 24-hr  $\geq$  300mg. Use of both these tests can be considered in the evaluation and management of patients with suspected preeclampsia.

## Results

Figure 1: Summary of Patient Enrollment\*



\* Due to collection or lab error, some patients did not have results for both 12-hr urine and PCR

Table 1. Baseline maternal characteristics by 24 hour urine protein result

	24-hr protein < 300 mg (N=62)	24-hr protein $\geq$ 300 mg (n=28)	P-value
Maternal age (yrs)	29 (19-42)	30 (19-38)	0.76
Race/Ethnicity			
Caucasian	49 (79%)	22 (79%)	0.41
Black	2 (3%)	3 (11%)	
Asian	3 (5%)	0 (0%)	
Hispanic	1 (2%)	1 (4%)	
Private insurance	45 (73%)	20 (71%)	0.91
Multiparous	29 (47%)	20 (71%)	0.03
Multiple gestation	8 (13%)	3 (11%)	0.77
BMI	33.1 (19.5-69.9)	36.4 (25.4-54.9)	0.13
Gestational age (wks)	34.3 (29.9-39.0)	32.8 (24.0-35.4)	0.007
Smoking	13 (21%)	4 (14%)	0.45
Comorbidity (any)*	57 (91%)	26 (93%)	0.88
cHTN	12 (19%)	8 (29%)	0.33
gHTN or preeclampsia	15 (24%)	7 (25%)	0.93
Pregestational diabetes	1 (2%)	1 (2%)	0.015
Gestational diabetes	9 (13%)	4 (14%)	0.30
Indications for admission*			
Elevated blood pressure	51 (82%)	26 (93%)	0.19
Proteinuria	16 (26%)	19 (68%)	<0.001
Symptoms <sup>A</sup>	28 (45%)	14 (50%)	0.67
Lab abnormalities	7 (11%)	11 (39%)	0.002
Fetal growth restriction	10 (16%)	3 (14%)	0.50
Other <sup>+</sup>	9 (15%)	6 (21%)	0.42
Median SBP during collection	131 (99-165)	136 (105-152)	0.11
Median DBP during collection	76 (53-98)	78 (55-99)	0.41

Data are in median (range) or n (%). BMI, body mass index. \*Subject may have more than one. cHTN, chronic hypertension. gHTN, gestational hypertension. <sup>A</sup>Includes headache, scotomata, abdominal pain, and significant weight gain associated with edema. <sup>+</sup>Includes shortness of breath, seizure of uncertain origin, oligohydramnios, visual changes other than scotomata. SBP, systolic blood pressure. DBP, diastolic blood pressure.

Table 2. Urine collection characteristics by 24 hour urine protein result

	24-hr protein < 300 mg (N=62)	24-hr protein $\geq$ 300 mg (n=28)	P-value
24-hr urine protein (mg)	175 (90-290)	520 (310-6360)	<0.001
24-hr urine volume (ml)	2300 (700-4700)	1825 (600-5100)	0.23
24-hr urine CrCl (ml/min)	153 (59-272)	135 (80-283)	0.51
12-hr urine protein (mg)	70 (40-150)	255 (120-2640)	<0.001
12-hr urine volume (ml)	1050 (40-2300)	1050 (300-3050)	0.97
12-hr urine protein $>$ 165mg	0 (0%)	27 (96%)	<0.001
Protein:creatinine ratio	0.16 (0.07-0.5)	0.35 (0.14-4.57)	<0.001
Protein:creatinine ratio $>$ 0.15	30 (52%)	24 (89%)	0.001

Data are in median (range) or n (%). CrCl, creatinine clearance.

Figure 2: 12-hour urine protein vs. 24-hour urine protein

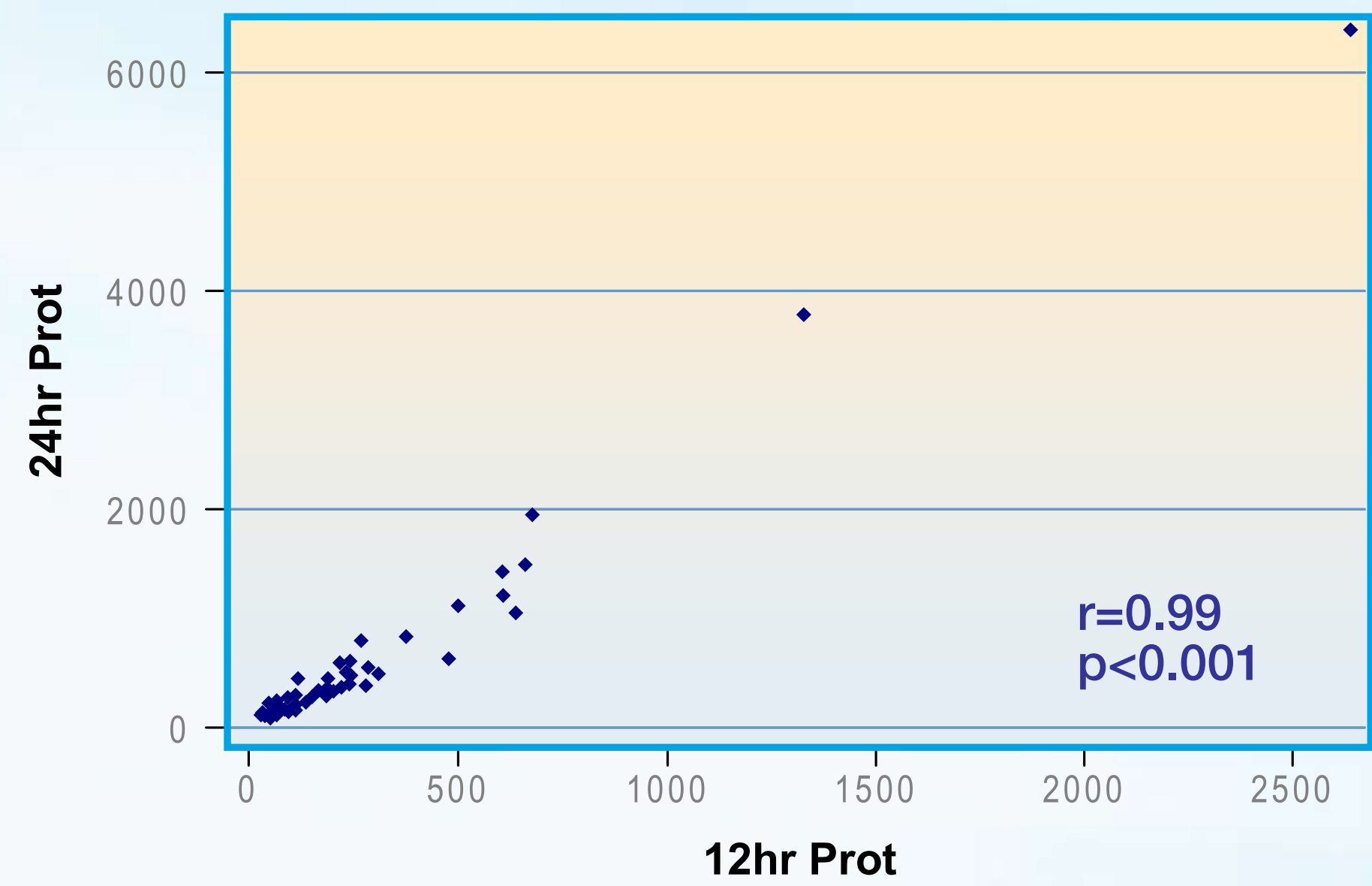


Figure 4: Protein:creatinine ratio vs. 24-hour urine protein

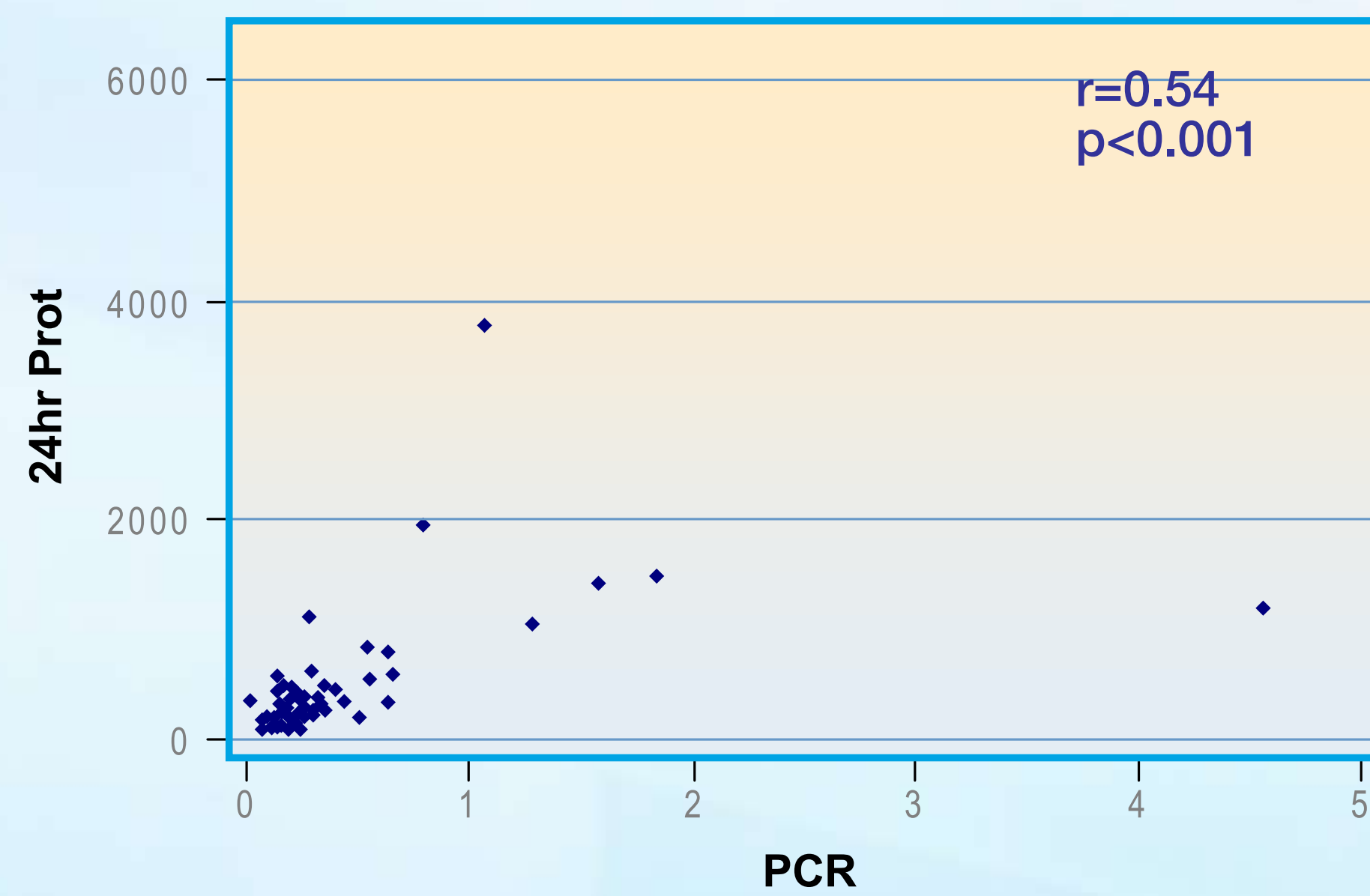


Table 3. Test characteristics of 12-hr urine protein  $>$  165 mg and protein:creatinine ratio  $>$  0.15 for the prediction of 24-hr urine protein  $\geq$  300 mg

	12-hr urine protein $>$ 165mg	PCR $>$ 0.15
Sensitivity	96 (90-99)	89 (81-94)
Specificity	100 (96-100)*	49 (39-59)
PPV	100 (96-100)*	32 (23-42)
NPV	98 (93-100)	91 (84-96)

Data are in % (95% confidence interval). PCR, protein:creatinine ratio. PPV, positive predictive value. NPV, negative predictive value.

\*Confidence interval is 97.5%.

Figure 3: ROC for 12-hour urine protein

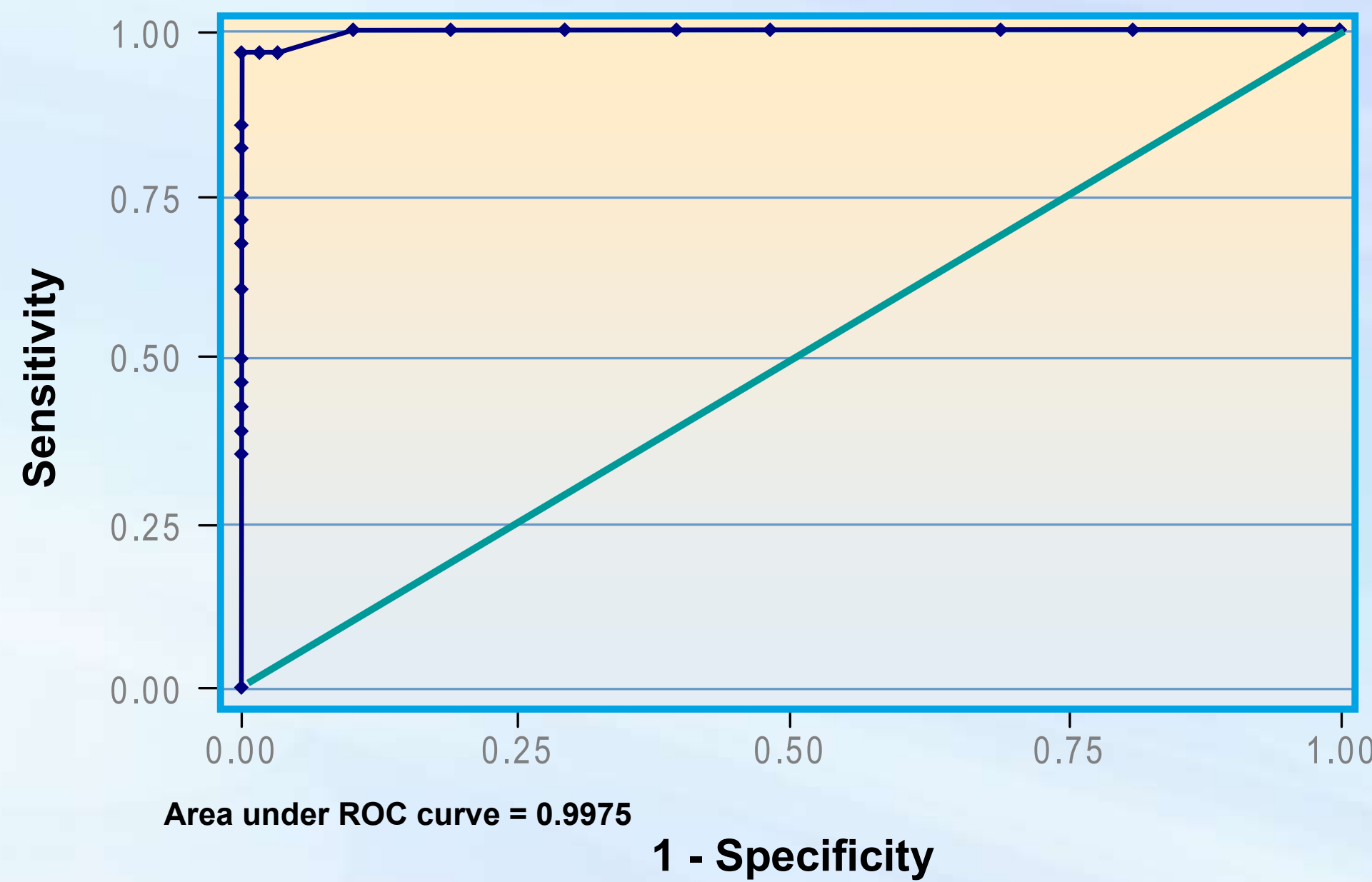
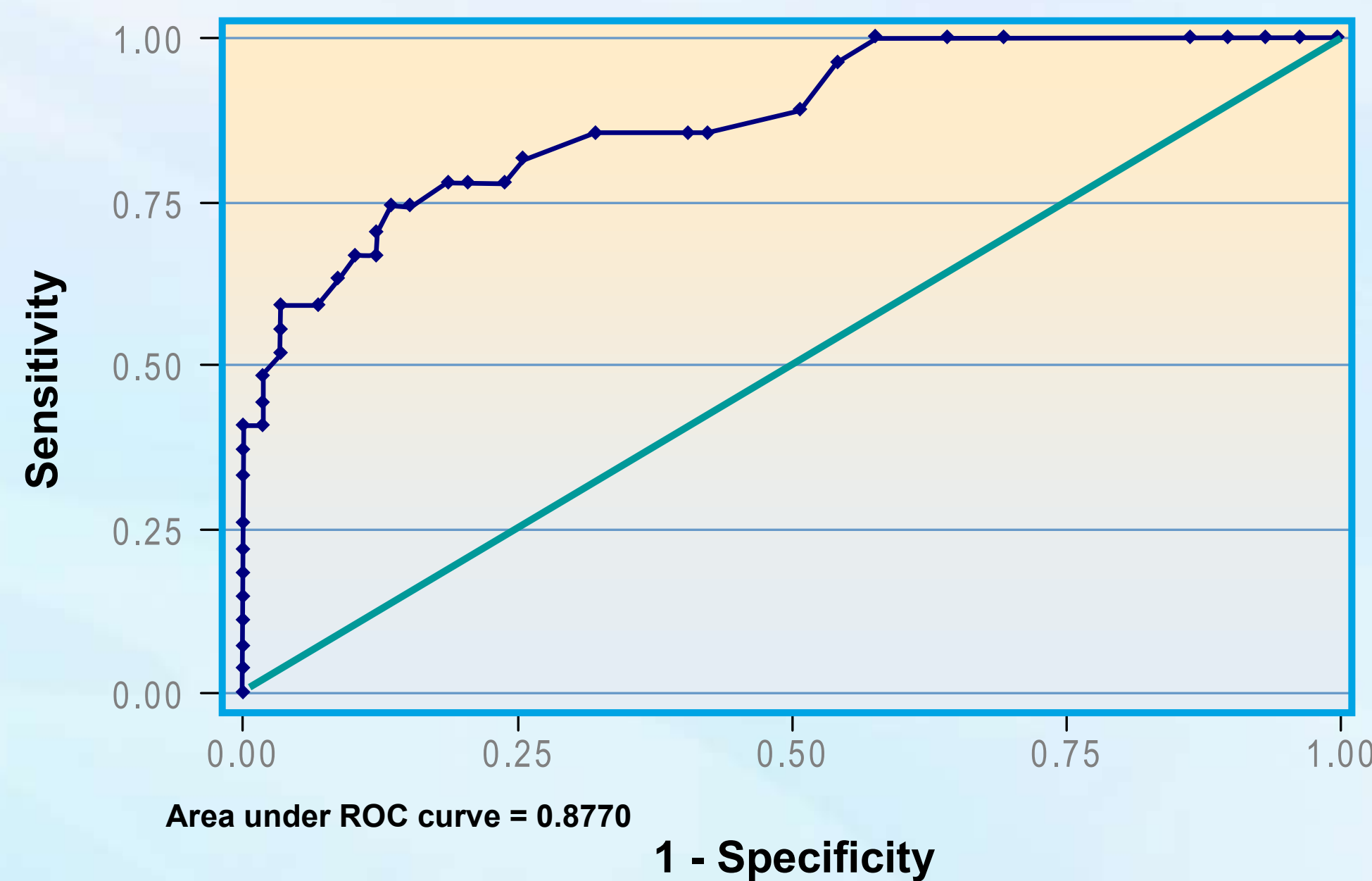


Figure 5: ROC for protein:creatinine ratio



## Conclusions

- 12-hr urine protein  $>$  165mg is a good surrogate for 24-hr urine protein  $\geq$  300mg with the potential benefit of earlier diagnosis and treatment of preeclampsia
- Protein:creatinine ratio  $>$  0.15 may be most useful as a screening tool to rule out 24-hr urine protein  $\geq$  300mg due to its high negative predictive value
- Applying these results to the management of patients with suspected preeclampsia has the potential to:
  - Improve compliance with outpatient collection
  - Decrease healthcare costs by decreasing the number of admissions and length of admissions
  - Decrease morbidity by decreasing time to diagnosis

## Strengths

- “Real life” study design generalizable to clinical practice
- First study to prospectively test previously generated cutoffs
- Inpatient setting allowed consistency and compliance with collection technique

## Weaknesses

- Small sample size lacks power to correlate with maternal and fetal outcomes
- May not be generalizable to outpatient setting – uncertain impact of hospitalization (diet, sleep pattern, activity)

## Future Studies

- Develop and prospectively study a clinical algorithm for the diagnosis of preeclampsia incorporating 12-hr urine protein and protein:creatinine ratio in both the inpatient and outpatient settings
- Correlate these test cutoffs with maternal and fetal outcomes

## References

- Report of the National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy. Am J Obstet Gynecol 2000;183:S1-S22.
- Cunningham FG, Leveno KJ, Bloom SL, Hauth JC, Rouse D, Spong C. Pregnancy Hypertension. In: Williams Obstetrics. 23rd ed. New York: McGraw-Hill, 2010: Chapter 34.
- Diagnosis and Management of Preeclampsia and Eclampsia. ACOG Practice Bulletin No.33. American College of Obstetricians and Gynecologists. 2002
- Lindheimer M, Kanter, D. Interpreting abnormal proteinuria in pregnancy: the need for a more pathophysiological approach. Obstet Gynecol 2010 Feb; 115(2 Pt 1):365-75.
- Rinehart BK, Terrone DA, Larmon JE, Perry KG Jr, Martin RW, Martin JN Jr. A 12-hour urine collection accurately assesses proteinuria in the hospitalized hypertensive gravida. J Perinatol 1999;19:556-8.
- Adelberg AM, Miller J, Doerzbacher M, Lambers DS. Correlation of quantitative protein measurements in 8-, 12-, and 24-hour urine samples for the diagnosis of preeclampsia. Am J Obstet Gynecol 2001;185:804-807.
- Schubert FP, Abernathy MP. Alternative evaluations of proteinuria in the gravid hypertensive patient. J Reprod Med 2006;51:709-714