ABSTRACT

Very small amounts of blood can be visually detected in the urine and may be the only warning sign of a life threatening problem. A systematic documentation of the visual appearance of gross hematuria specimens was not previously performed. The clinical advantage of possessing a library of photographs documenting exact volumes of blood in known urine specimen volumes was not appreciated. To simulate hematuria, known quantities of anti-coagulated blood were added to 50 ml urine specimens of various specific gravities/concentrations and then photographed on white graph paper. The gross hematuria specimen photographs were arranged sequentially to create a Hematuria Reference Chart. An unknown hematuria specimen can now be visually matched to the Hematuria Reference Chart to determine blood loss per ml of voided urine. The Hematuria Reference Chart is available on-line to health care professionals and patients for documentation, education and diagnosis.

CAUSES OF HEMATURIA

- Cancer
- Trauma
- Inflammation
- Infection
- Foreign Bodies
- Vascular
- Glomerular Disease
- Hematologic
- Activity
- Menstruation
- Loin Pain – Hematuria Syndrome

METHODS AND MATERIALS

A photographic library of simulated gross hematuria specimens was created and arraigned to produce a hematuria reference chart. Voided urine was collected from a solitary volunteer during various hydration states to obtain urine of different specific gravities / concentration. Increasing amounts of whole anti-coagulated blood were added to volumes of collected urine to create 50 ml simulated gross hematuria specimens. The simulated gross hematuria specimens were photographed (in clear urine specimen cups) on white graph paper background with blue lines. All of the simulated gross hematuria specimen photographs and the Hematuria Reference Chart were uploaded to YouTube and Google Images.

INTRODUCTION

Hematuria is not normal and its cause must be determined. Most episodes of gross hematuria are not due to life threatening conditions or diseases; but, some episodes are the only warning sign of a life threatening problem. Very small amounts of blood can be visually detected in urine and the amount of blood does not reliably predict the seriousness of the underlying cause of the hematuria. The presence of visible blood in the urine can cause fear and anxiety in patients and healthcare providers alike. Accurately estimating the volume of blood mixed in the urine can help direct treatment and eliminate unwarranted concerns of serious blood loss. Without a reference standard, estimating blood loss from hematuria is imprecise and without scientific basis.

PROCEDURE FOR USING HRC

Example:

Step 1:
Verify a total of 50 ml of gross hematuria sample in a clear standard 120 ml urine specimen cup viewed on a background of white graph paper.

Step 2:
Select the most appropriate row based on urine specific gravity and match the unknown specimen to the column of added blood on the HRC.

Step 3:
Calculate blood loss from hematuria (Voided volume/50 X added blood volume from HRC/cup) = total whole blood loss in ml/void.

If patient voids 500 ml:
500ml/50=10; 10 x 0.034ml= 0.34 total whole blood loss ml/void

DISCUSSION

The online availability of the Michigan State University College of Osteopathic Medicine Hematuria Reference Chart enables patients and health care providers to quantify and document hematuria. Even when patients don’t have online access to the Hematuria Reference Chart, they can photograph their hematuria specimen using a smartphone and send the pictures to their caregiver for comment. Urinary blood loss can now be tracked over the duration of the disease. The Hematuria Reference Chart is both an educational and diagnostic tool with documentation capabilities.