The every-sample urine collection study; when is the best time to do LH tests?

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Background

- There is some debate as to the optimum time to conduct urinary luteinising hormone (LH) tests in order to predict ovulation
- First morning void is often recommended as it is thought that at this time the urinary LH concentration shows the least day-day fluctuation
- Other researchers have suggested that LH levels peak in the afternoon, so testing at this time may be more appropriate
- This study aimed to determine whether there is an optimum test time for LH

Methods

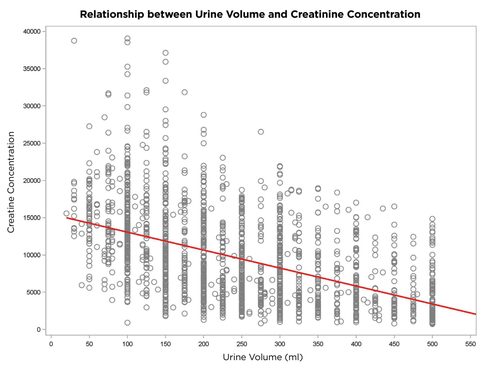
Women with regular menstrual cycles (n=18) were required to collect and measure volume of every single void of urine for one entire menstrual cycle. Time of void was also logged. Each void was then decanted into a sample pot for laboratory analysis. Specific gravity, creatinine (Cobas Miras™) and LH (AutoDELFIA™) were measured on all samples. LH concentration (both uncorrected, and corrected for concentration differences using specific gravity and creatinine) was charted for each volunteer across each day for their complete menstrual cycle. One cycle was annovular and therefore excluded from LH analysis.

Results

There was very little relationship between urine volume and urine concentration (creatinine concentration and specific gravity) as shown in the scatter plots (Figure 1).

Figure 1: Relationship between urine volume and (a) creatinine concentration, and (b) specific gravity

a



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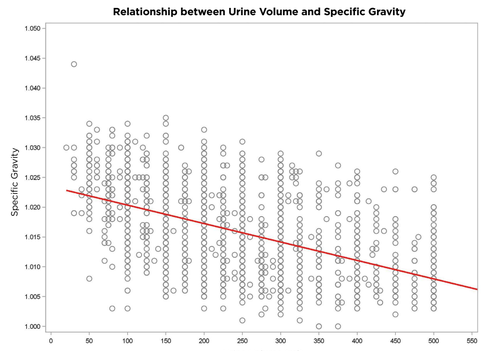
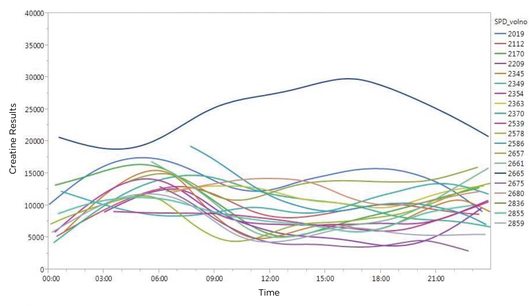


For many women, the first morning void was consistently a concentrated sample. However, for other volunteers, this void tended to be the most dilute. Figure 2 shows the individual profiles of urine concentration, as measured by specific gravity or creatinine, by time of day. Individual volunteer profiles were built from the median concentration for each void time window for each day.

Figure 2: Individual volunteer profiles of urine concentration, as measured by (a) creatinine or (b) specific gravity in relation to time of day

a



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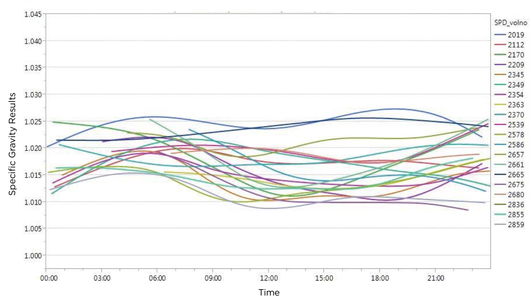
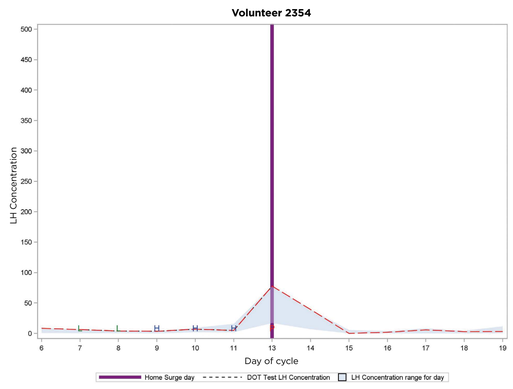


LH concentration did not have a consistent time of the day at which levels peaked. The early morning void showed LH concentrations ranging from the highest to the lowest levels of the day, as shown in Figure 3.

Figure 3: Individual volunteer profiles of LH range for each day of the cycle. The first morning void LH concentration is indicated by the red line. Volunteer shown in (a) has the highest LH concentration in first morning void. Volunteer shown in (b) has the lowest LH concentration of the day in first morning void, whereas the first morning void for volunteer shown in (c) has an average level of LH concentration. Home ovulation test results are also shown (L=low fertility; H=high fertility; P=peak fertility). DOT Test LH concentration is first morning void sample on which the digital ovulation tests were performed.

a



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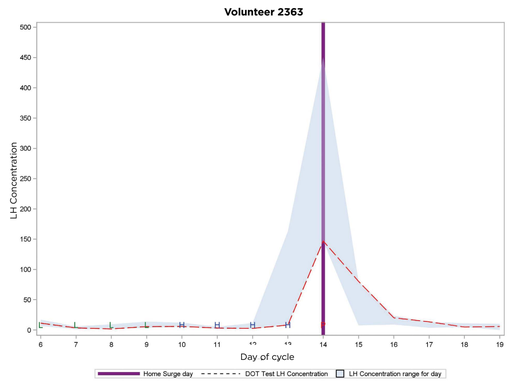

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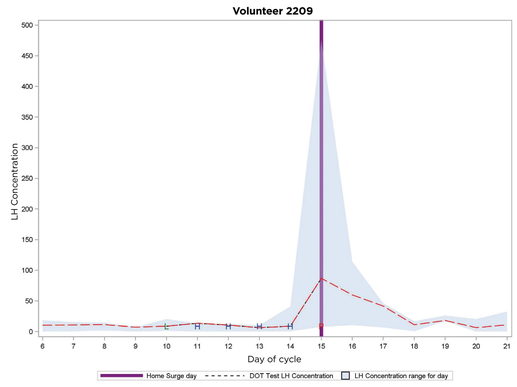
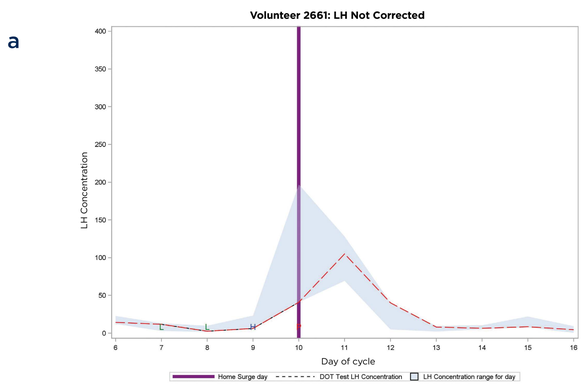


Using daily measurements at the same time of the day, the LH surge was never missed as LH elevation lasted a minimum of 24 hours. If a consistent time of day was chosen, daily measurements gave a surge day that was at most one day different compared with measuring a different void. Results were equivalent whether uncorrected or concentration corrected using creatinine or specific gravity (Figure 4).

Figure 4: Individual volunteer profile of LH range for each day of the cycle, where LH is (a) uncorrected, (b) corrected by specific gravity or (c) corrected by creatinine. Home ovulation test results are also shown (L=low fertility; H=high fertility; P=peak fertility). DOT Test LH concentration is first morning void sample on which the digital ovulation tests were performed.

a



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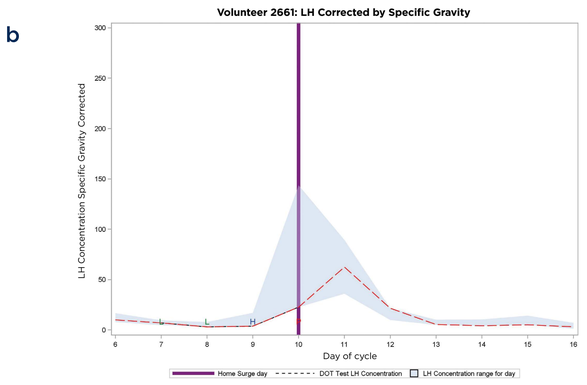

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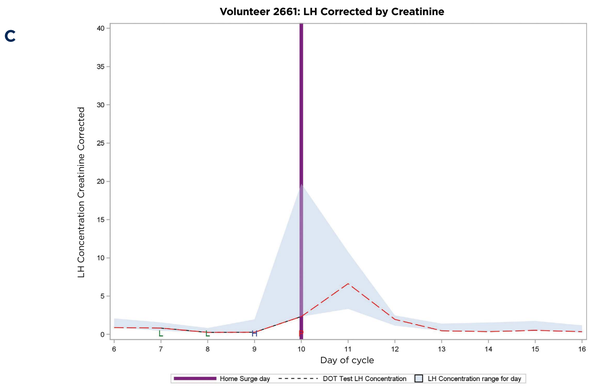

Conclusions

- There is no optimum time of the day to measure LH, as long as daily measurements are taken at a consistent time of day
- Variation in urine concentration had no effect on LH surge detection
- For convenience, first morning void can be suggested as it provides an easy-to-follow testing strategy

Declaration of interest

Funded by SPD Development Company Ltd., a fully owned subsidiary of SPD Swiss Precision Diagnostics GmbH, the manufacturer of Clearblue pregnancy and fertility tests. S. Johnson, L. Marriott and P. Smith are all employees of SPD Development Company Ltd.

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