

## Chapter 7

### General Conclusions

1. Determination of CO in unsedated standing horses by either thermodilution or M-mode echocardiography is difficult due to patient movement. Movement interferes with the steady-rate administration of intravenous drips, causes delays in obtaining satisfactory echocardiographic images, prevents the safe application of EKG leads, and presents a risk to personnel and equipment. Heart rates are also noticeably labile in unsedated conscious horses, which may interfere with “steady state” CO determinations.
2. Dopamine, dobutamine, and detomidine plus butorphanol, at the dosages used in this study, can be used to induce a range of cardiac outputs across which the measurement methods of M-mode echocardiography and TD can be compared in anesthetized horses. Inclusion of dopamine in the protocol offers no additional benefits over the use of dobutamine, however, and is less reliable for increasing CO. Inclusion of detomidine provides an additional change which can be measured, but does not increase the overall range of CO over that produced by halothane plus dobutamine. It is likely that butorphanol could be deleted from the protocol without altering results.
3. Cardiac outputs determined by simultaneous thermodilution and M-mode echocardiography are significantly related. The mathematical relationship between the two methods can be used to predict thermodilution CO ( $CO_{TD}$ ) from an M-mode echocardiographic determination of CO ( $CO_{echo}$ ). However,  $CO_{echo}$  measurements are associated with a relatively large standard error, resulting in a broad 95% prediction interval. Consequently,  $CO_{echo}$  may need to change by as much as 100% in order to be 95%

confident that a change in determined value represents true hemodynamic change. This broad range of predicted values inhibits the usefulness of  $CO_{\text{echo}}$ .

4. M-mode echocardiographic determination of CO in anesthetized horses exhibits a non-proportional bias by which it underestimates CO relative to TD. It is also more variable than TD. The primary factor responsible for the variability is relatively low repeatability of the individual M-mode measurements. Results might be improved if the mean of 3-5 consecutive beats was used for each measurement, but as determined in this experiment,  $CO_{\text{echo}}$  is too variable to have confidence in its use for precise determinations of CO.