Method
Participants
Fourteen medical students with normal to corrected-to-normal vision took part in the study.

Equipment and Materials
The main training apparatus consisted of a Stryker 888 endoscope, a Stryker Quantum 300 light source, a Stryker 888 zero-degree 10-mm camera, and a surgical trainer. The Multiple Resource Questionnaire (MRQ; Boles, Bursk, Phillips, and Perdelwitz, 2007), and the NASA Task Load Index (NASA TLX; Hart and Staveland, 1988) were administered to assess subjective workload.

Projection System
The display image was presented on a rear projection screen with an overlapping projector array consisting of 9 Epson EMP-82 LCD projectors (2000 lumens, XGA resolution) (see Figure 1). To manipulate display size, conditions of 1, 4, or 9 projectors were used. Horizontal X vertical display sizes were 31.5” x 22”, 50” x 39.5”, and 70” x 48”, respectively.

Results
Performance
Two repeated-measures ANOVAs indicated that the difference in both number of rings transferred and transfer accuracy were not significantly different between the three different projector conditions.

Mental Workload
NASA Task Load Index (NASA-TLX)
A 3 [display condition] x 6 (TLX scales) repeated-measures ANOVA found no main effect of screen size. However, an analysis of the subscales revealed a main effect of size on mental demand which approached significance. A repeated-measures t-test revealed mental demand was significantly higher for the 1 projector display condition than the 9 projector display condition.

Conclusions and Implications
•No current evidence that image quality issues associated with tiled display systems substantially impair performance in a surgical training task.
•Although a global measure of workload indicated that the tiled displays were the least demanding to use, participants reported deploying additional but highly specific cognitive resources when using these same displays.
•A large degree of variability was observed in terms of display size preference and stated strategies, therefore a fruitful avenue for future research on large-format displays for surgery is a more formal focus on spontaneous strategy choice as a function of display size.

References