Supporting Information

Grover et al. 10.1073/pnas.1104651108

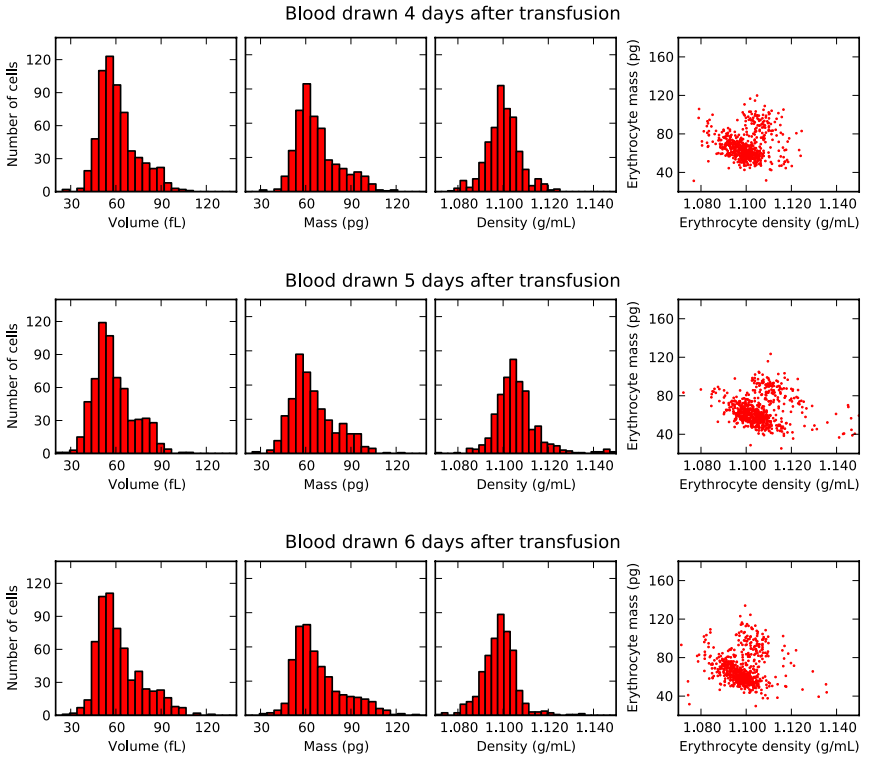

Fig. S1. Analysis of repeated blood draws from the transfused, suspected thalassemia trait patient in Fig. 4*D* ($n = 625$ cells from each blood draw). All samples were analyzed within 3 d of collection. The patient's erythrocyte volume, mass, and density distributions remain virtually unchanged over 3 d. In the scatter plots of erythrocyte mass vs. density, the small group of nonthalassemic erythrocytes corresponding to cells received via transfusion remains clearly distinguishable.

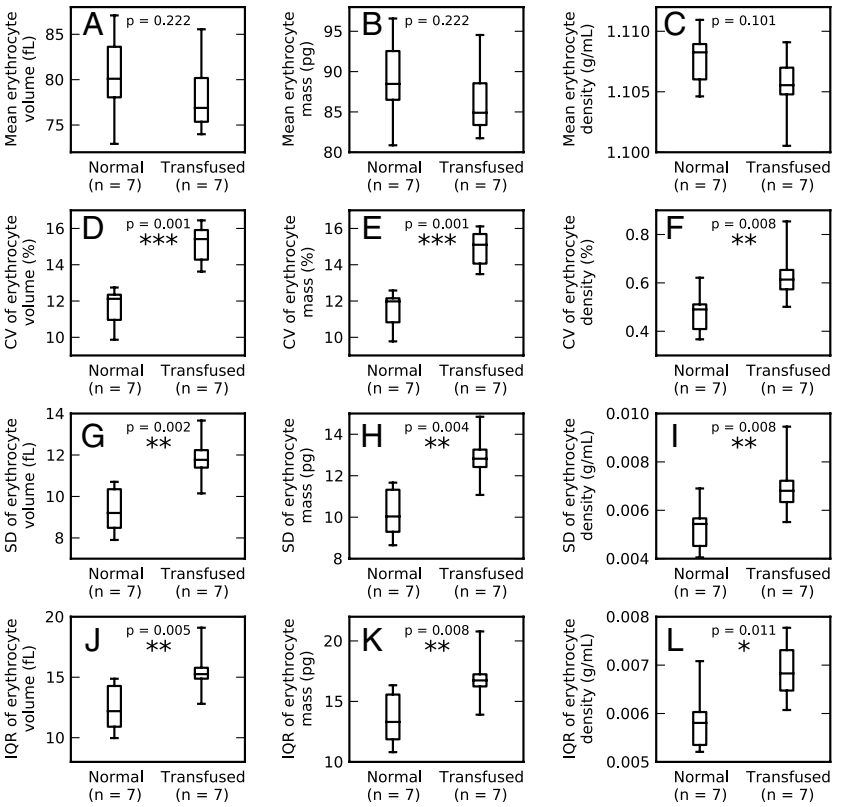

Fig. S2. Erythrocyte mass, volume, and density measurements for seven recently transfused individuals and seven nontransfused individuals. The patients' mean erythrocyte volumes (*A*), masses (*B*), and densities (*C*) are not significantly different between the normal and transfused groups ($p > 0.01$). The coefficients of variation (*D*–*F*), standard deviations (*G*–*I*), and interquartile ranges (*J*–*L*) of the patients' erythrocyte volumes, masses, and densities are significantly different between the normal and transfused groups ($p < 0.01$). These measurements show that transfusion recipients have greater cell-to-cell variation in their erythrocyte densities, masses, and volumes than nontransfused individuals. *P* values are from the Mann–Whitney U test.

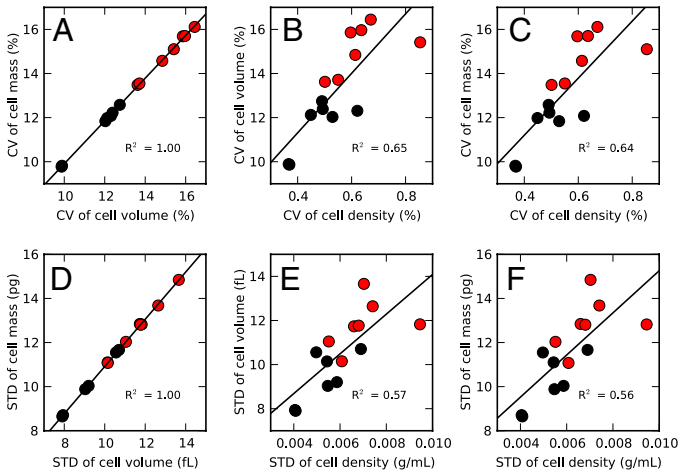

Fig. S3. Correlations among the distribution widths of erythrocyte volumes, masses, and densities measured by the suspended microchannel resonator (SMR), for the 14 individuals in Fig. S2, measured as either coefficient of variation (*A*–*C*) or standard deviation (*D*–*F*). Red points indicate recently transfused individuals, and black points indicate nontransfused individuals. The distribution widths of the erythrocyte masses and volumes correlate extremely well with each other (*A*, *D*), and density distribution moderately correlates with volume distribution and mass distribution (*B*, *C*, *E*, *F*). This suggests that an individual with increased cell volume variability likely will have increased cell mass and density variability as well, though the cell density variability is not solely a function of mass or volume variability.

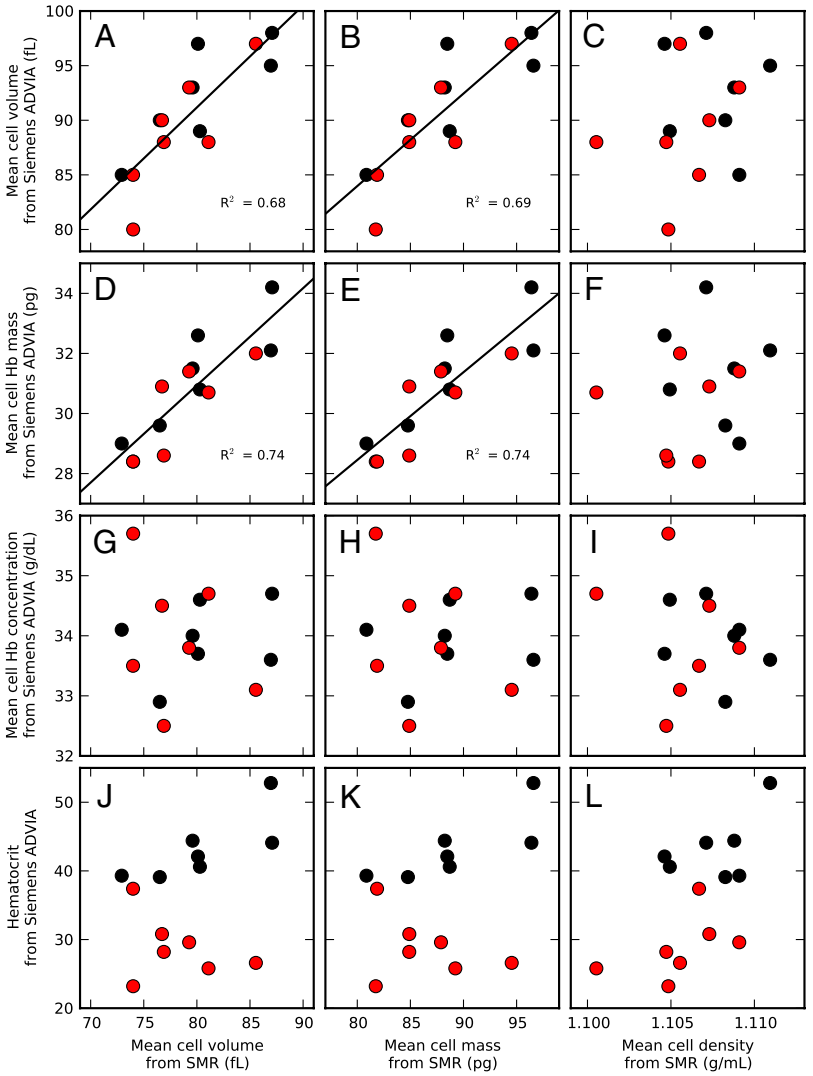

Fig. S4. Comparisons between parameters measured by the Siemens ADVIA clinical hematology instrument and parameters measured by our SMR for the 14 individuals in Fig. S2. Red points indicate recently transfused individuals, and black points indicate nontransfused individuals. Both the ADVIA and the SMR measure mean cell volume, and there is a reasonable correlation between the mean volumes measured by the two instruments (*A*). Similar correlations exist between the mean cell volume from the ADVIA and the mean cell mass from the SMR (*B*). Additional correlations can be found between the mean cell hemoglobin (Hb) mass from the ADVIA and the mean cell volume and mass from the SMR (*D*, *E*). However, mean cell hemoglobin concentration and hematocrit from the ADVIA did not obviously correlate with mean cell volume or mass from the SMR (*G*, *H*, *J*, *K*). In addition, cell density from the SMR did not obviously correlate with any of the ADVIA's measurements (*C*, *F*, *I*, *L*). This suggests that the factors that determine erythrocyte density are not merely a function of the cell's size or hemoglobin content, or an individual's hematocrit.

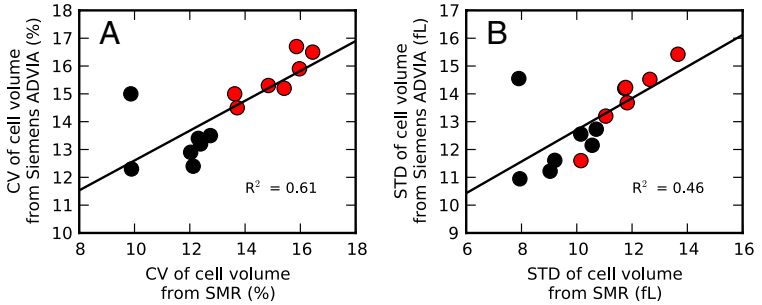

Fig. S5. Comparisons between the distribution widths of erythrocyte volumes measured by the Siemens ADVIA and our SMR, for the 14 individuals in Fig. S2, measured as either coefficient of variation (*A*) or standard deviation (*B*). Red points indicate recently transfused individuals, and black points indicate nontransfused individuals. The distribution widths of the individuals' erythrocyte volumes agree well between the ADVIA and SMR instruments (with the exception of one possible outlier, a nontransfused patient whose cell volume distribution width was measured to be within the nontransfused range by the SMR but within the transfused range by the ADVIA).

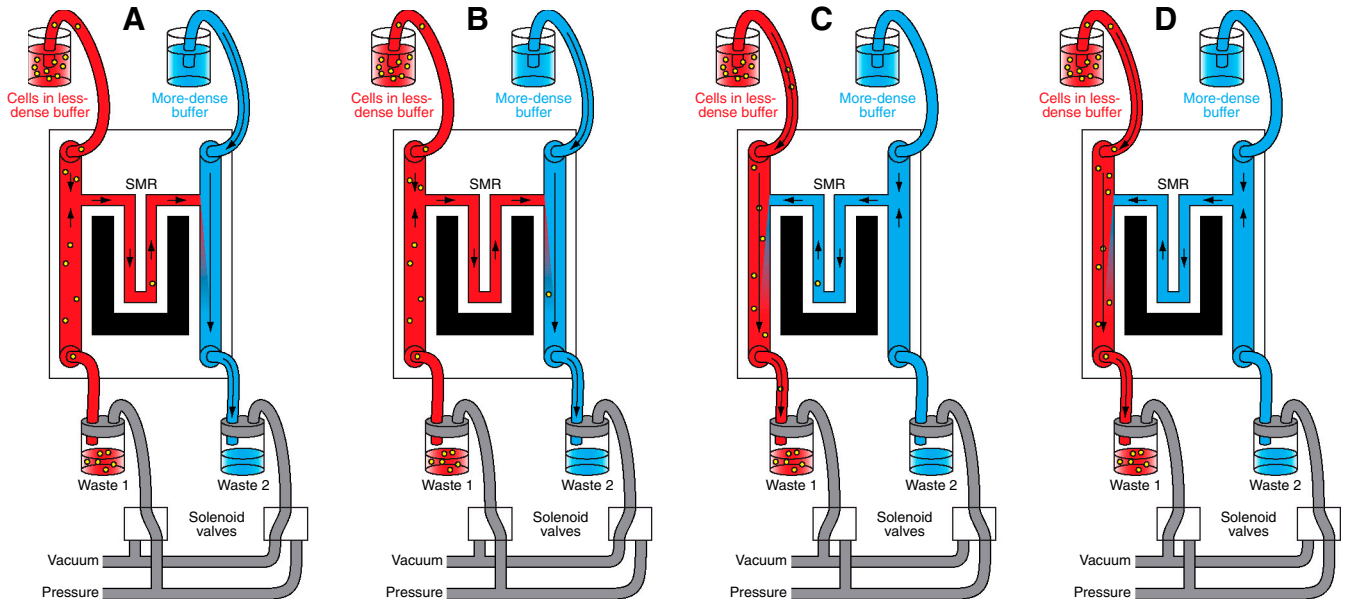

Fig. S6. Diagram of density measurement system. Briefly, a pressure differential between two parallel fluid paths (red and blue) sends a single cell from the red path through the resonating cantilever (SMR) and into the blue path. Once the buoyant mass of the cell is measured in the cell's native media or buffer (red), the fluid flow reverses direction to measure the same cell in the alternate-density fluid (blue) and the system is reset. See *Materials and Methods* for details.