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Fast luminous blue transients from newborn black holes

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Newborn black holes in collapsing massive stars can be accompanied by a fallback disc. The accretion rate is typically super-Eddington and strong disc outflows are expected. Such outflows could be directly observed in some failed explosions of compact (blue supergiants or Wolf-Rayet stars) progenitors, and may be more common than long-duration gamma-ray bursts. Using an analytical model, we show that the fallback disc outflows produce blue UV-optical transients with a peak bolometric luminosity of $\sim 10^{42-43}$ erg s $^{-1}$ (peak R-band absolute AB magnitudes of -16 to -18) and an emission duration of $\sim$ a few to ~ 10 d. The spectra are likely dominated intermediate mass elements, but will lack much radioactive nuclei and iron-group elements. The above properties are broadly consistent with some of the rapid blue transients detected by Panoramic Survey Telescope & Rapid Response System and Palomar Transient Factory. This scenario can be distinguished from alternative models using radio observations within a few years after the optical peak.

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