Introduction:
Immune status characterization in Intensive Care Unit (ICU) patients presents a major challenge due to the heterogeneity of response. In this study, the FilmArray® system was used with customized gene assays to assess the immune profile of critically-ill ICU patients compared to healthy volunteers; from within the REALISM cohort.

Methods:
A customized FilmArray® pouch containing 24 assays was designed; 16 target and 8 reference genes. Detection and semi-quantification of assays from whole blood collected in PAXgene tubes occurs in the device within 1 hour. A total of 20 subjects from the REALISM cohort were tested in duplicates: 1 trauma, 5 septic shock and 5 surgery patients, along with 9 healthy volunteers. The patients’ selection was based on HLA-DR expression on monocytes, and PHA-(Phytohaemagglutinin) stimulated T-cell proliferation assay, to have various immune profiles.

Results:
Quantification cycle values of the target genes were normalized by the geometrical mean of reference genes to account for the different cell counts among specimens. The number of the CD3+ cells and HLA-DR, determined by flow cytometry, showed good correlation to CD3D and CD74 gene expression, respectively. Seven genes showed significant differences in expression levels between the healthy volunteers and patient groups: CD3D, CD74, CTLA4 & CX3CR1 were down-regulated, while IL-10, IL1RN and S100A9 were up-regulated in the patient populations. The use of relative quantitative difference of some markers was able to distinguish and emphasize the variability between the patient groups while homogenizing the discrepancy among healthy volunteers.

Conclusion:
The FilmArray® system was shown to allow host transcriptomics analysis of immune-relevant genes directly from PAXgene tubes, in only one hour. These results show great potential for the development of a fully automated immune profiling tool, enabling close monitoring of critically-ill patients.