Purpose:
To develop a version of an automated inverse planning system (mdaccAutoPlan) for VMAT based on the previous developed system for IMRT in order to improve the efficiency and quality of VMAT treatment planning, and to discover the plan quality of VMAT in comparison to IMRT for stage III lung cancer.

Methods:
Two groups of patients with stage III lung cancer were randomly selected in this study. For each patient, three plans were studied – two IMRT plans respectively designed by an experienced dosimetrist from our institution and by mdaccAutoPlan, and a VMAT plan generated by mdaccAutoPlan. For group I, the dosimetrists have spent their best effort in designing the IMRT plans in order to compete with mdaccAutoPlan; however, in group II, the dosimetrists were not in competition and has spent their regular effort. Dosimetric measurements were performed to evaluate the plan quality of the three types of plans. An experienced radiation oncologist blind-reviewed the three plans of each patient and ranked them based on their plan quality.

Results:
For both groups, the VMAT plans resulted in comparable plan quality to the IMRT plans generated by the mdaccAutoPlan system. Compared to the IMRT plans generated by dosimetrists – for group I, the VMAT plans show similar overall quality and better PTV conformity, esophagus sparing and complication-free tumor control probability (p+); for group II, the VMAT plans show superior plan quality in terms of PTV conformity, lung, heart, and esophagus sparing, and p+. On average, the VMAT plans received better ranking from the oncologist than the IMRT plans.

Conclusions:
Combining with our in-house mdaccAutoPlan system, VMAT is capable of generating high quality treatment plans for stage III lung cancer. VMAT plans result in superior/similar quality to the IMRT plans that were designed from mdaccAutoPlan or from a dosimetrist’s best effort.