Astrocytic and oligodendroglial gliomas are intrinsic brain tumours characterized by infiltrative growth and resistance to classic cancer therapies, which renders them inevitably lethal. Glioblastoma, the most common type of glioma, also exhibits neoangiogenesis and profound immunosuppressive properties. Accordingly, strategies to revert glioma-associated immunosuppression and promote tumour-directed immune responses have been extensively explored in rodent models and in large clinical trials of tumour immunotherapy. This Review describes vaccination approaches investigated for the treatment of glioma. Several strategies have reached phase III clinical trials, including vaccines targeting epidermal growth factor receptor variant III, and the use of either immunogenic peptides or tumour lysates to stimulate autologous dendritic cells. Other approaches in early phases of clinical development employ multipeptide vaccines such as IMA-950, cytomegalovirus-derived peptides, or tumour-derived peptides such as heat shock protein-96 peptide complexes and the Arg132His mutant form of isocitrate dehydrogenase. However, some preclinical trial data suggest that addition of immunomodulatory reagents such as immune checkpoint inhibitors, transforming growth factor-β inhibitors, signal transducer and activator of transcription 3 inhibitors, or modifiers of tryptophan metabolism could augment the therapeutic activity of vaccination and overcome glioma-associated immunosuppression.