Abstract — In Japan, there are 4,200 dialysis facilities and the number of clinical engineer (CE) working in dialysis section is approximately 9,600. The new CE who engages in dialysis will receive the education program which consists of fifteen items for twelve weeks and the evaluation of the progress in program is performed by the senior CE using a checklist. Currently, cleaning of the dialysate is demanded and the CE will take responsibility for the cleaning dialysate. As for the dialyzer, the problem of polyvinylpyrrolidone (PVP) eluted from Polysulfone (PS) membrane dialyzer is remained. CEs must wear an ability to cope with these problems overall and provide the best medical care to patients.

Introduction
Currently, the number of clinical engineer (CE) working in a hospital is more than 12,000 in Japan and about 80% of those CEs engage in dialysis section. The duties of CE in the dialysis unit are setup of the dialysis circuit and dialyzer, puncture of vascular access, patient monitoring under treatment, management of the dialyzer, maintenance of dialysis machine.

In Japan, the number of dialysis patients is approximately 300,000 and there are 4,200 dialysis facilities. The patient with severe condition is treated in the university hospital or the regional core hospital and the chronic stable patient is treated in the dialysis clinic.

In order to cope with the increasing dialysis patients, the dialysis equipment which monitors patient's condition during treatment by computer has been used. It is important for CEs to acquire knowledge for managing those high technology machines.

Education
The new CE who engage in dialysis section will receive the education program for twelve weeks in parallel to the hospital education program. The hospital education program include healthcare-associated infection and infection control team activity, prevention of occupational infection, medical care security, nutrition management and medical safety, medical equipment safety, transfusion and medication management.

On the other hands, the education program in dialysis section include disease and clinical condition, general patient care, principle of the dialysis equipment, maintenance of equipment and the technical education by the practical skill such as trouble correspondence during dialysis treatment. Evaluation of the progress in program is performed by the senior CE using a checklist. This checklist consists of fifteen items, such as dialysis equipment and patient care.

Clean dialysate
The dialyzer with a high-flux dialysis membrane has been widely used to remove actively β2 microglobulin as a precaution against complication of long-term dialysis patients. On the other hands, the problem such as the inflow of the endotoxin from dialysate occurs. Dialysate purity has become a major concern in recent years since it was shown that low levels of endotoxin in dialysate were able to induce the production of proinflammatory cytokines. Currently, cleaning of the dialysate is demanded in the dialysis facilities and the CE will take responsibility for the cleaning dialysate as same as for the management of the concentration of dialysate.

Problem of dialyzer
Polysulfone (PS) membrane dialyzer is most popularly used and the use of PS dialyzer accounts for 50% in Japan. The reason is superior in the permeability of the material, water permeability, and also PS membrane dialyzer can hold high material permeability during treatment because of the low protein adsorption to the membrane. Moreover, it is manufactured in low coat.

However, when using the PS membrane dialyzer, a case indicating dialysis incompatibility such as the hypotension has been noted. The reason is thought to be that the polyvinylpyrrolidone (PVP) being combined as hydrophilic base material in PS membrane manufacture elutes from dialyzer membrane during treatment and flow into patient body.

Future prospects
The tasks of CEs engaging in dialysis unit are a choice of dialysis materials, maintenance of equipment, patient monitoring during treatment and other duties. Therefore, CEs must wear an ability to manage these duties overall as well as the knowledge of machine and a technique that can provide the best medical care to patients.