Background
Gastric cancer is one of the most common cancers worldwide. In the United States 22,000 cases were reported in 1996 and nearly 14,000 deaths were attributed to stomach cancer. In Japan the incidence of gastric cancer is nearly six fold higher than in the United States. The reasons for this are unclear but persons who migrate from Japan to America have a dramatic decrease in the risk of gastric cancer, implying that diet may play an important role in its carcinogenesis.

The Japanese Research Society for the Study of Gastric Cancer (JRSCG) has standardized guidelines for the surgical extirpation and pathologic evaluation of gastric cancer. The lymph nodes that drain the stomach are classified into 16 different stations, which are further classified into four groups. Specifically, group N1 is defined as the lymph node stations 1 through 6 and consists of peri-gastric lymph nodes. Lymph nodes in stations 7 through 11 are considered group N2 nodes and consist of peri-arterial nodes, that is lymph nodes that surround the gastric artery, the hepatic artery, the celiac artery and the splenic artery.

A surgical procedure that removes the cancer, a surrounding rim of normal stomach, the greater and lesser omenta, and group N1 lymph nodes is called a D1 dissection. A D2 dissection removes the same structures plus a part of the transverse mesocolon and all N2 lymph nodes. In order to adequately resect all N2 lymph nodes the spleen and tail of the pancreas are removed as well.

A major controversy in the treatment of gastric cancer revolves around the role of lymph node removal. Surgeons in Japan routinely perform a D2 procedure. In contrast, in the United States gastric surgery usually involves extirpation of the gastric cancer and only a sampling of peri-gastric lymph nodes (D1 surgery). Reports from Japan consistently show better survival after a D2 gastrectomy but these results have not been reproduced in the United States and other Western countries.

In order to determine the role of an extended lymph node dissection as part of the curative surgery of gastric cancer, the Dutch Gastric Cancer group undertook a nationwidestudy comparing D1 and D2 surgeries for gastric cancer.

Materials and Methods
996 patients entered the study between 1989 and 1993. All patients had adenocarcinoma of the stomach and a negative metastatic work-up. Patients were randomly assigned to receive either a D2 or D1 procedure. All patients were evaluated every three months during the first year and every six months thereafter.

At the time of laparotomy the surgeon assessed whether or not a curative procedure was possible. Patients were treated with curative intent if the tumor was completely removable and no metastases to the liver, peritoneum or distant lymph nodes were noted. Sampling of distant lymph nodes (including the para-aortic and retroperitoneal lymph nodes) was mandatory. After final pathological examination, the operation was classified as R0 if all tumor was removed, the distant lymph node sampling was negative for cancer and cytology of abdominal cavity washings was negative for cancer.

To ensure proper surgical technique at all of the eighty participating centers, all Dutch surgeons were assisted in the operating room by an expert from Japan or one of eight Dutch experts specifically trained in the D2 operation. Pathologic examination of the specimen focused on counting the number of lymph nodes in each of the stations. If the pathologist could not detect lymph nodes in more than one station that should have been dissected, a ?noncompliance? violation was ruled. Alternatively, if lymph node stations were dissected that should not have been this was termed ?contamination?. No patient treated with curative surgery underwent adjuvant radiotherapy or chemotherapy.
Results
Twenty-nine percent of the 996 eligible patients were found to have incurable tumors at the time of surgery and were excluded from the protocol, leaving 771 patients for study entry of whom 380 underwent a D1 procedure and 331 a D2 procedure. Of the 711 patients, 632 underwent an R0 resection.

D2 dissections were associated with significantly more complications, a longer hospital stay and a higher incidence of peri-operative mortality than were D1 procedures. There was no difference in five-year survival between those receiving the D2 versus D1 procedure, 33% and 34%, respectively. For patients who underwent a curative R0 operation, the five-year survival rates were higher but did not differ by the type of operation (45% for D1 and 47% for D2).

The risk of relapse between the two groups also did not differ significantly. For those patients undergoing an R0 operation, the risk of relapse at five years for a D2 and D1 dissection was 37% and 43%, respectively.

Conclusion
The authors conclude that in Dutch patients a D2 dissection does not confer a survival advantage over a D1 operation, and is associated with higher rates of peri-operative morbidity and mortality. However, this trial must be critically examined before accepting this conclusion. Non-compliance with the study protocol was high. Despite great efforts to ensure proper surgical dissection including having an expert surgeon present for all D2 operations, 51% of D2 patients did not have lymph nodes detected on pathological evaluation from two or more stations. In addition, patients undergoing D1 dissections often had too many or too few lymph nodes removed. These protocol violations blur the distinction between a D1 and D2 procedure.

In an accompanying editorial, Dr. Murray Brennan of the Memorial Sloan Kettering Cancer Center on New York, writes that a survival advantage from an extended lymph node dissection is likely small, if one exists at all, and D2 procedures should only be performed by surgeons specifically trained in this surgery so as to limit peri-operative morbidity and mortality.