



1  
00:00:05,910 --> 00:00:03,270  
let's uh head to the payload operations

2  
00:00:07,510 --> 00:00:05,920  
integration center um at the marshall

3  
00:00:10,629 --> 00:00:07,520  
space flight center in huntsville

4  
00:00:12,629 --> 00:00:10,639  
alabama laurie meigs is there and lori i

5  
00:00:16,070 --> 00:00:12,639  
understand we're talking about space

6  
00:00:18,150 --> 00:00:16,080  
station technology that's turned into a

7  
00:00:19,029 --> 00:00:18,160  
fairly marvelous spin-off for us here on

8  
00:00:20,950 --> 00:00:19,039  
earth

9  
00:00:23,910 --> 00:00:20,960  
that's right neuroarm is a clinical

10  
00:00:25,910 --> 00:00:23,920  
research project where robotic arm works

11  
00:00:27,750 --> 00:00:25,920  
hand in hand with brain surgeons it

12  
00:00:29,509 --> 00:00:27,760  
works like the canadarm robotic arm on

13  
00:00:31,189 --> 00:00:29,519

the space station although on a very

14

00:00:32,950 --> 00:00:31,199

much smaller scale

15

00:00:34,950 --> 00:00:32,960

now dr garnett sutherland he is a

16

00:00:37,270 --> 00:00:34,960

professor of neurosurgery at the

17

00:00:39,670 --> 00:00:37,280

university of calgary and he shares how

18

00:00:42,470 --> 00:00:39,680

this technology has become quite a game

19

00:00:44,389 --> 00:00:42,480

changer in the operating room

20

00:00:45,110 --> 00:00:44,399

project near arm is a

21

00:00:48,069 --> 00:00:45,120

is

22

00:00:50,229 --> 00:00:48,079

the idea of translating

23

00:00:52,150 --> 00:00:50,239

all the great research and development

24

00:00:54,150 --> 00:00:52,160

of space robotics

25

00:00:55,270 --> 00:00:54,160

into the operating room here on our

26

00:00:56,950 --> 00:00:55,280

planet

27

00:00:58,549 --> 00:00:56,960

so we're talking about interoperable

28

00:01:00,150 --> 00:00:58,559

surgeries right inoperable brain

29

00:01:03,750 --> 00:01:00,160

surgeries that are now we're talking

30

00:01:06,070 --> 00:01:03,760

about brain surgery and we might use

31

00:01:09,109 --> 00:01:06,080

a statement that the outcome from brain

32

00:01:11,109 --> 00:01:09,119

surgery while being great

33

00:01:13,910 --> 00:01:11,119

can get better

34

00:01:16,469 --> 00:01:13,920

and for us to make it better

35

00:01:18,789 --> 00:01:16,479

that probably does require collaborative

36

00:01:20,070 --> 00:01:18,799

efforts between science engineering and

37

00:01:23,190 --> 00:01:20,080

medicine

38

00:01:26,870 --> 00:01:23,200

and one philosophy we had is would it

39

00:01:30,069 --> 00:01:26,880

not be wonderful if one could merge

40

00:01:31,830 --> 00:01:30,079

diagnosis with therapy

41

00:01:33,830 --> 00:01:31,840

that would require advanced

42

00:01:36,950 --> 00:01:33,840

interoperative imaging

43

00:01:39,350 --> 00:01:36,960

and to put machine technology into the

44

00:01:41,350 --> 00:01:39,360

imaging technologies so that you can

45

00:01:42,789 --> 00:01:41,360

conduct operations while you're taking

46

00:01:43,749 --> 00:01:42,799

the pictures

47

00:01:45,830 --> 00:01:43,759

wow

48

00:01:47,030 --> 00:01:45,840

so that would allow surgeons to do

49

00:01:48,550 --> 00:01:47,040

things they

50

00:01:51,429 --> 00:01:48,560

currently can't do

51  
00:01:54,389 --> 00:01:51,439  
and that would allow surgeons to always

52  
00:01:55,830 --> 00:01:54,399  
know the effect of what they're doing as

53  
00:01:58,550 --> 00:01:55,840  
they're doing that

54  
00:02:00,069 --> 00:01:58,560  
so how has this all come together how

55  
00:02:01,749 --> 00:02:00,079  
how did the

56  
00:02:03,910 --> 00:02:01,759  
neurosurgery world meet up with the

57  
00:02:06,149 --> 00:02:03,920  
robotics world so many years ago we

58  
00:02:08,469 --> 00:02:06,159  
began a project on building an

59  
00:02:10,469 --> 00:02:08,479  
intraoperative mri device and so we

60  
00:02:12,150 --> 00:02:10,479  
built one we put it on the ceiling of an

61  
00:02:13,910 --> 00:02:12,160  
operating room and it can come in and

62  
00:02:16,390 --> 00:02:13,920  
out as the surgeon wants

63  
00:02:20,710 --> 00:02:16,400

but that interrupts surgery during

64

00:02:22,470 --> 00:02:20,720

imaging so i remember around 2002

65

00:02:24,390 --> 00:02:22,480

i found a company called mcdonald debt

66

00:02:25,430 --> 00:02:24,400

roller associates they're the company

67

00:02:27,670 --> 00:02:25,440

that built

68

00:02:30,550 --> 00:02:27,680

space arm and the special purpose texas

69

00:02:32,869 --> 00:02:30,560

manipulator and said to them you know

70

00:02:35,110 --> 00:02:32,879

you people build complex robots for

71

00:02:37,350 --> 00:02:35,120

complex space places

72

00:02:40,470 --> 00:02:37,360

and i would like to join a project where

73

00:02:42,550 --> 00:02:40,480

we build a robot for that magnet

74

00:02:45,430 --> 00:02:42,560

that we can put inside the magnet and it

75

00:02:48,150 --> 00:02:45,440

can conduct neurosurgery

76

00:02:51,670 --> 00:02:48,160

inside the bore of a mr machine

77

00:02:53,509 --> 00:02:51,680

so that project began around 2002

78

00:02:55,670 --> 00:02:53,519

and the robot was delivered in about

79

00:02:58,309 --> 00:02:55,680

2008

80

00:02:59,430 --> 00:02:58,319

and we redid the inter-operative mri

81

00:03:01,750 --> 00:02:59,440

project

82

00:03:04,630 --> 00:03:01,760

around 2010 and now we're using the

83

00:03:06,309 --> 00:03:04,640

robot for clinical cases

84

00:03:08,630 --> 00:03:06,319

tell me how the mri is involved with

85

00:03:10,390 --> 00:03:08,640

that if you have a neurosurgical problem

86

00:03:12,149 --> 00:03:10,400

or neurological problem you will

87

00:03:14,630 --> 00:03:12,159

commonly go see your doctor and your

88

00:03:17,910 --> 00:03:14,640

doctor will send you for an mri

89

00:03:19,670 --> 00:03:17,920

an mri allows your physicians to see

90

00:03:21,270 --> 00:03:19,680

inside your body

91

00:03:23,750 --> 00:03:21,280

specifically your head

92

00:03:25,110 --> 00:03:23,760

so we can see your brain and we can see

93

00:03:27,190 --> 00:03:25,120

the problem

94

00:03:29,509 --> 00:03:27,200

that's affecting your brain

95

00:03:31,589 --> 00:03:29,519

furthermore the mri gives even more

96

00:03:33,430 --> 00:03:31,599

information like

97

00:03:35,270 --> 00:03:33,440

where are the important areas in your

98

00:03:37,910 --> 00:03:35,280

brain that need to be avoided

99

00:03:39,430 --> 00:03:37,920

and it even can display the connections

100

00:03:40,949 --> 00:03:39,440

between the right and the left and

101  
00:03:43,270 --> 00:03:40,959  
between

102  
00:03:46,630 --> 00:03:43,280  
within the hemispheres of the brain

103  
00:03:48,149 --> 00:03:46,640  
so we have this rich data set

104  
00:03:50,229 --> 00:03:48,159  
of everything we

105  
00:03:51,190 --> 00:03:50,239  
of your problem and its effect on your

106  
00:03:53,670 --> 00:03:51,200  
brain

107  
00:03:56,550 --> 00:03:53,680  
then you go see your neurosurgeon who

108  
00:03:58,949 --> 00:03:56,560  
tends to operate on you

109  
00:04:02,470 --> 00:03:58,959  
knowledgeable of the images but doesn't

110  
00:04:03,509 --> 00:04:02,480  
actually operate in the image

111  
00:04:05,830 --> 00:04:03,519  
so

112  
00:04:08,789 --> 00:04:05,840  
the theme of this project is

113  
00:04:10,869 --> 00:04:08,799

the person would be getting images

114

00:04:14,390 --> 00:04:10,879

but then the robotic arms

115

00:04:16,390 --> 00:04:14,400

would enter the image

116

00:04:18,069 --> 00:04:16,400

and remove it while you're taking

117

00:04:19,590 --> 00:04:18,079

pictures of it

118

00:04:23,270 --> 00:04:19,600

and that's the fundamental goal of the

119

00:04:25,110 --> 00:04:23,280

project what does the robot look like

120

00:04:27,590 --> 00:04:25,120

he looks like he looks like a surgeon

121

00:04:29,189 --> 00:04:27,600

without a head

122

00:04:32,390 --> 00:04:29,199

so the robot

123

00:04:33,830 --> 00:04:32,400

the robot has two arms connected to a

124

00:04:36,230 --> 00:04:33,840

base

125

00:04:38,550 --> 00:04:36,240

and the robot's arms are much

126  
00:04:41,189 --> 00:04:38,560  
like a human's arms

127  
00:04:42,710 --> 00:04:41,199  
and they have joints much like a human's

128  
00:04:45,590 --> 00:04:42,720  
hands have joints

129  
00:04:48,550 --> 00:04:45,600  
and the surgeon controls that

130  
00:04:50,950 --> 00:04:48,560  
larger robot using hand controllers

131  
00:04:53,670 --> 00:04:50,960  
which are really miniature robots

132  
00:04:54,830 --> 00:04:53,680  
so however the surgeon moves their hand

133  
00:05:00,629 --> 00:04:54,840  
the robot

134  
00:05:02,550 --> 00:05:00,639  
motions of a human surgeon

135  
00:05:05,590 --> 00:05:02,560  
so then our patients come to the

136  
00:05:07,990 --> 00:05:05,600  
hospital they see us in our clinics

137  
00:05:09,270 --> 00:05:08,000  
and we schedule them for surgery and we

138  
00:05:11,189 --> 00:05:09,280

tell them

139

00:05:12,870 --> 00:05:11,199

that we're going to use the robot for

140

00:05:14,550 --> 00:05:12,880

part of your operation

141

00:05:16,230 --> 00:05:14,560

and we believe the robot is a benefit

142

00:05:19,350 --> 00:05:16,240

for your operation

143

00:05:20,629 --> 00:05:19,360

and it invariably people want the robot

144

00:05:22,390 --> 00:05:20,639

used

145

00:05:25,749 --> 00:05:22,400

in fact that you can sometimes see a

146

00:05:27,029 --> 00:05:25,759

little not a tear but a disappointment

147

00:05:29,110 --> 00:05:27,039

should you say no we're not using the

148

00:05:31,029 --> 00:05:29,120

robot for your case

149

00:05:32,950 --> 00:05:31,039

type thing

150

00:05:33,990 --> 00:05:32,960

and then we begin that process of

151  
00:05:35,350 --> 00:05:34,000  
showing

152  
00:05:36,710 --> 00:05:35,360  
how the robot

153  
00:05:40,469 --> 00:05:36,720  
benefits

154  
00:05:42,230 --> 00:05:40,479  
or doesn't benefit a surgical procedure

155  
00:05:43,749 --> 00:05:42,240  
let's talk about success stories tell us

156  
00:05:46,230 --> 00:05:43,759  
some

157  
00:05:50,469 --> 00:05:46,240  
well our very first patient was a young

158  
00:05:54,550 --> 00:05:52,870  
and she just had her child

159  
00:05:55,830 --> 00:05:54,560  
so we took her tumor out of a small

160  
00:05:57,749 --> 00:05:55,840  
opening

161  
00:05:58,870 --> 00:05:57,759  
using the precision and accuracy of the

162  
00:06:02,070 --> 00:05:58,880  
machine

163  
00:06:04,230 --> 00:06:02,080

coupling it to the executive capacity of

164

00:06:06,550 --> 00:06:04,240

the surgeon at a workstation

165

00:06:09,029 --> 00:06:06,560

and or the assistant surgeon

166

00:06:10,710 --> 00:06:09,039

and we've had many more

167

00:06:12,629 --> 00:06:10,720

than her sins

168

00:06:14,070 --> 00:06:12,639

and we tend to use the robot at least

169

00:06:15,990 --> 00:06:14,080

once a week

170

00:06:18,390 --> 00:06:16,000

what would have been her prognosis had

171

00:06:20,790 --> 00:06:18,400

you not been able to use that

172

00:06:23,029 --> 00:06:20,800

so in these particular prognosis would

173

00:06:25,510 --> 00:06:23,039

have been pretty good using conventional

174

00:06:27,430 --> 00:06:25,520

surgical technique but we're trying to

175

00:06:29,990 --> 00:06:27,440

show that with

176  
00:06:31,510 --> 00:06:30,000  
machines and surgeons

177  
00:06:33,189 --> 00:06:31,520  
we will always deliver an excellent

178  
00:06:35,430 --> 00:06:33,199  
outcome

179  
00:06:37,350 --> 00:06:35,440  
so that might say i would like the bar

180  
00:06:39,510 --> 00:06:37,360  
to be raised

181  
00:06:41,830 --> 00:06:39,520  
and the other thing about

182  
00:06:44,550 --> 00:06:41,840  
machines like a robot in an operating

183  
00:06:46,710 --> 00:06:44,560  
room is all the data is digital

184  
00:06:49,029 --> 00:06:46,720  
so everything is recorded

185  
00:06:50,950 --> 00:06:49,039  
so people can play back

186  
00:06:53,110 --> 00:06:50,960  
and learn from that procedure

187  
00:06:55,510 --> 00:06:53,120  
and in theory they can play forward

188  
00:06:58,150 --> 00:06:55,520

which is one of the goals of the project

189

00:07:01,430 --> 00:06:58,160

to feed your mr machine

190

00:07:02,870 --> 00:07:01,440

your mr imaging data into the robot's

191

00:07:04,710 --> 00:07:02,880

workstation

192

00:07:06,870 --> 00:07:04,720

and practice your surgery

193

00:07:09,110 --> 00:07:06,880

before you actually do it so is it also

194

00:07:11,270 --> 00:07:09,120

being used to train surgeons yeah so

195

00:07:13,350 --> 00:07:11,280

this is a platform which we would expect

196

00:07:16,469 --> 00:07:13,360

to be an ideal training

197

00:07:17,909 --> 00:07:16,479

platform for surgery much like a pilot

198

00:07:20,629 --> 00:07:17,919

we'll use

199

00:07:23,189 --> 00:07:20,639

we'll go somewhere into a virtual pilot

200

00:07:25,270 --> 00:07:23,199

virtual airplane simulator

201

00:07:28,469 --> 00:07:25,280

robotic surgery offers

202

00:07:32,150 --> 00:07:28,479

the potential assimilation

203

00:07:33,350 --> 00:07:32,160

for the young trainees of surgery

204

00:07:35,029 --> 00:07:33,360

and those are just the earth

205

00:07:37,189 --> 00:07:35,039

applications the commercial production

206

00:07:39,110 --> 00:07:37,199

of these units is now much smaller and