



X-Boxing Back to Recovery

Active Video Gaming in Renal Transplant Patients

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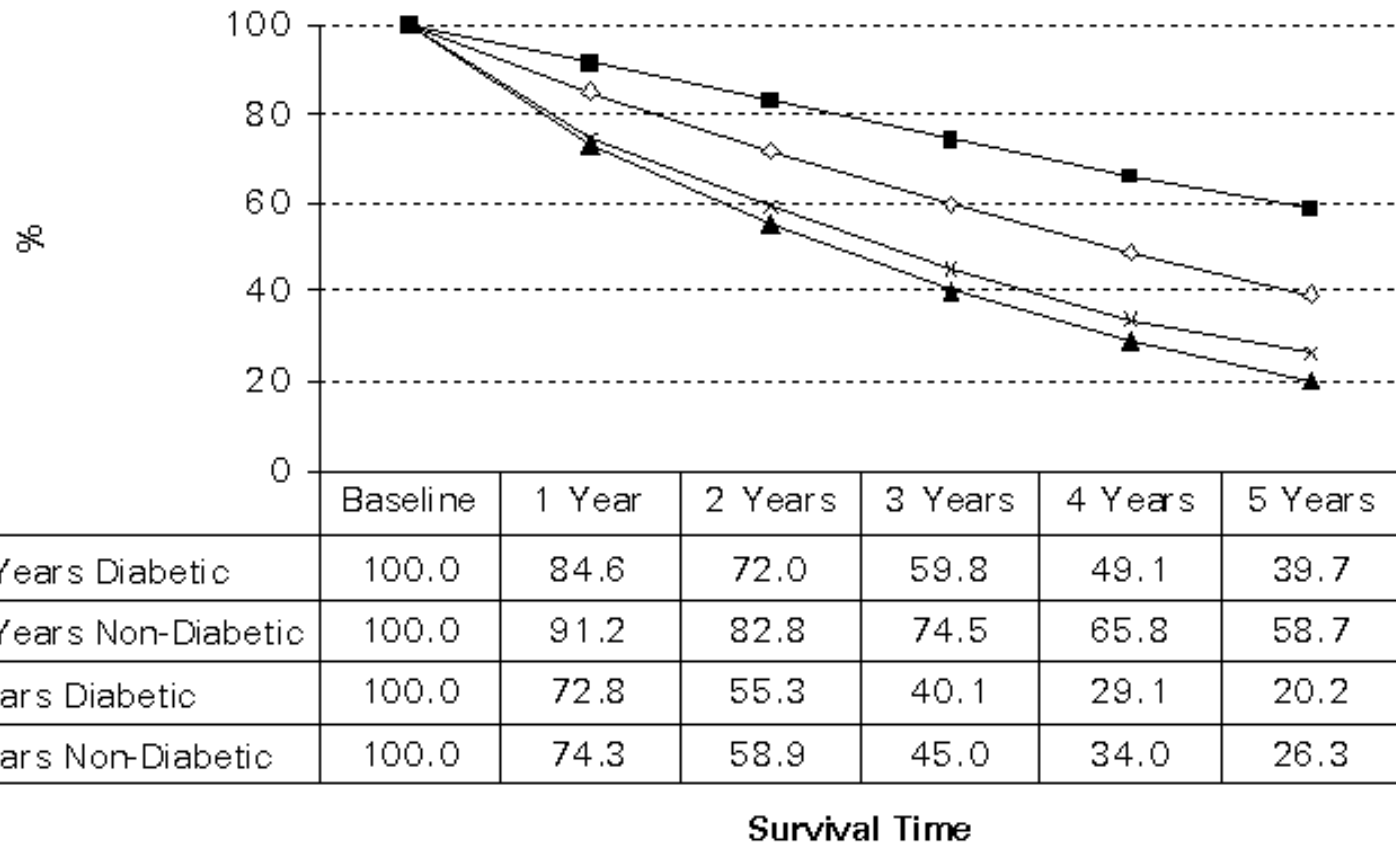
Capital Health Multi-Organ Transplant Program



What do we know about renal transplant patients?

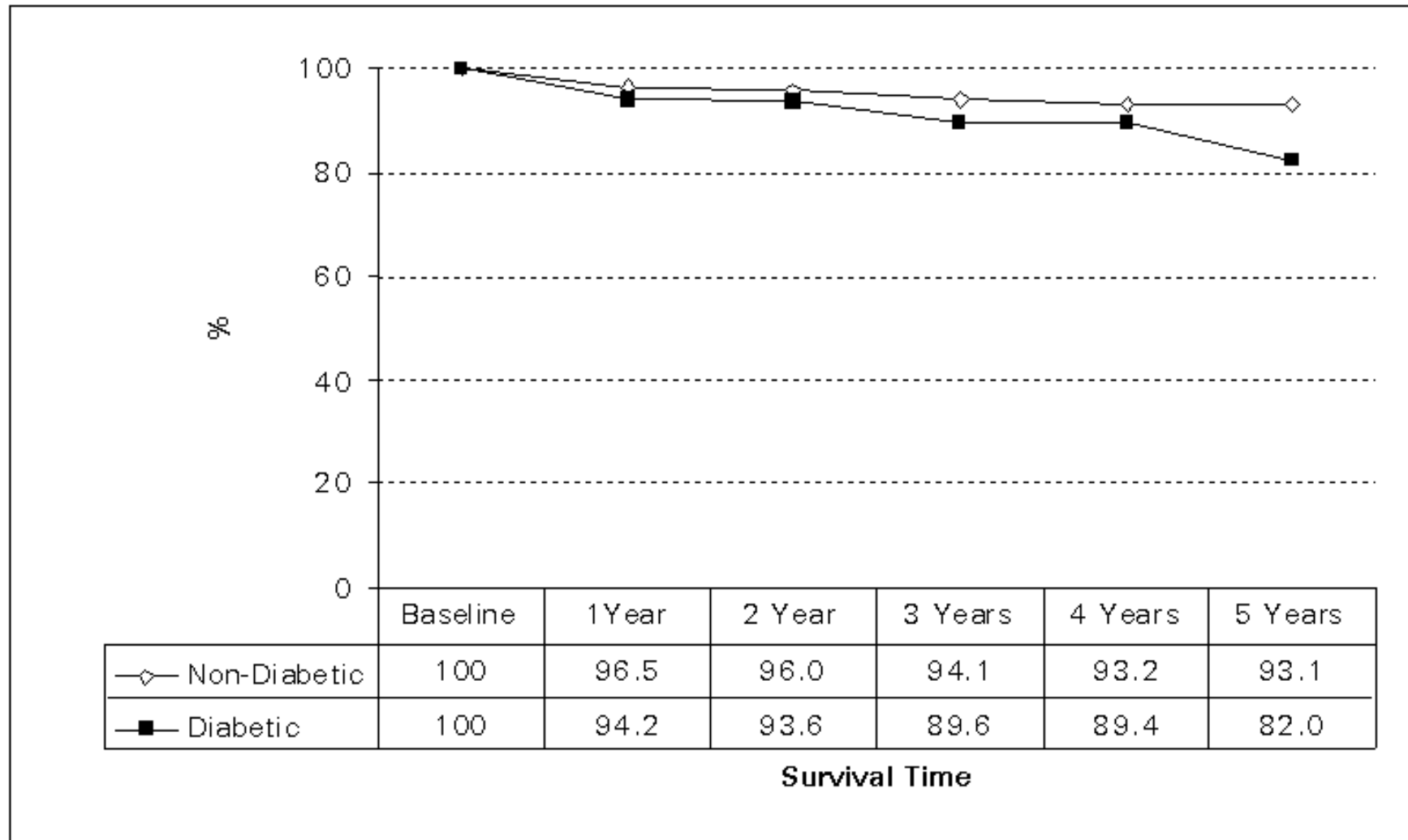


Survival Rates in Dialysis





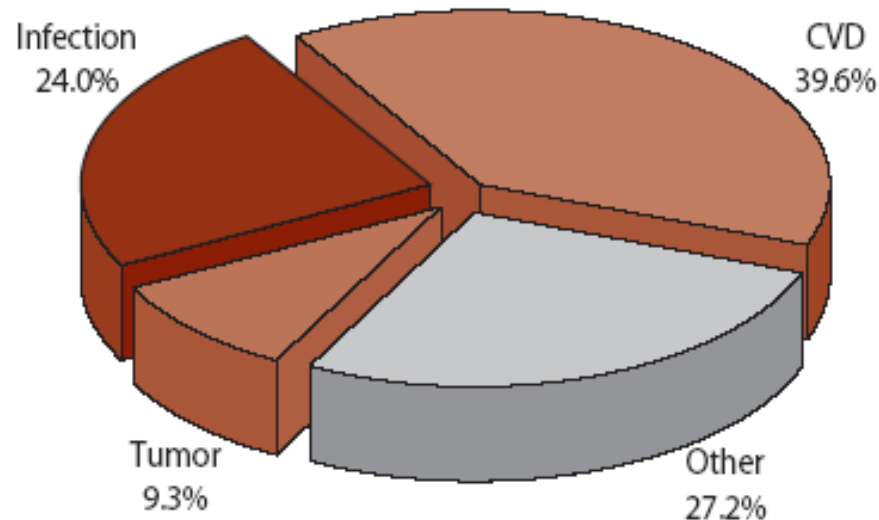
Survival Rates Post-Transplant





Causes of Mortality in Renal Transplant Patients

Figure 1 _____
Causes of Mortality in Renal Transplant Recipients¹⁴



USRDS 1st Kidney Transplants 1994-2000 (N=67,874)

USRDS = United States Renal Data System; CVD = cardiovascular disease

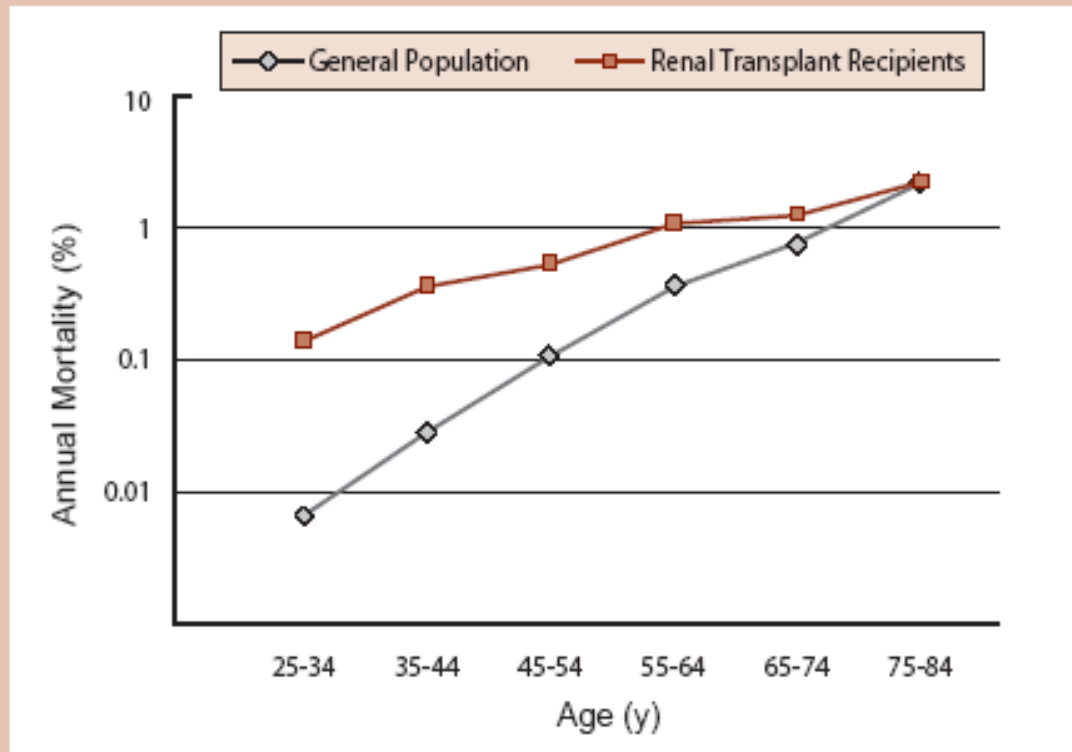
Courtesy of Bertram L. Kasiske, MD



Cardiovascular Mortality in Renal Transplant Patients

Figure 2

Annual Cardiovascular Mortality for Renal Transplant Recipients and the General Population by Age Group³



Adapted with permission from Foley RN, et al. *Am J Kidney Dis.* 1998;32:S112-S119.



Why the increased risk of CV mortality?

- **↓ GFR, ↑ proteinuria with CKD** (Pilmore et al, 2011; Muntner et al, 2001)
- **Common risk factor between CKD and CVD** (Longenecker et al, 2002)
- **Long term exposure to immunosuppressive medications** (Gordon et al, 2009; Svensson et al, 2012)



What is our current practice?

- **Optimize medication to ensure optimal transplant function**
- **Manage medical comorbidities**
- **PT**
- **Suggest for patients to exercise**



Exercise!

- **↓ Risk CVD mortality** (Gordon et al, 2009)
- **Better GFR, peak oxygen consumption, health-related fitness** (Painter et al, 2002)
- **Maintain musculoskeletal health** (Kosmadakis et al, 2010; Gordon et al, 2009)
- **Improved QOL, psychological well-being, self-reported functioning** (Painter et al, 2002; van Den Ham et al, 2007; Romano et al, 2010)



Barriers to Physical Activity

- **CKD → compromised exercise tolerance, musculoskeletal deterioration** (Painter et al, 2002)
- **Lack of motivation** (Gordon et al, 2005)
- **False belief about physical activity** (Gordon et al, 2005)
- **Canadian climate**



How do we get patients to exercise?





History of Video Games

VIDEO GAME timeline

As the world of video games continue to evolve, we take a look back at popular consoles and video games that helped make Nintendo, Sony, and Microsoft the giants they are today



1972
The world's first home video game console, the Magnavox Odyssey, sold 330,000 units in it's lifetime



1974
Gran Trak 10, the first racing arcade game, is released. It is the first arcade game to use ROM.



1974
Maze War is released. Considered to be the earliest first person shooter.



1977
Nintendo releases Color TV Game 8, packing 8 variations of "Light Tennis" (pong)



1979
Notable Releases: Asteroids, Lunar Lander, Monaco GP Flight Simulator



1980
Notable Releases: Pac-Man, Missile Command, Defender, Centipede



1983
Nintendo releases the Family Computer console in Japan and is later released in the United States as the Nintendo Entertainment System, 62 million units sold



1984
Notable Releases: Dragon Buster Tetris, Balloon Fight, Gauntlet, 1942, Paperboy



1986
The Sega Mega Drive (Sega Genesis in the US) is released. Sega's most successful console sold 29 million units



1986
Notable Releases: The Legend of Zelda, Out Run, Bubble Bobble, Dragon Quest, Metroid



1990
Nintendo releases the Super Famicom (SNES). The best selling console of the 16-bit era sold 49 million units

Other Releases: Alter Beast, Super Mario Bros. 3, Power Pad, Neo Geo Game Gear, TurboExpress, Bonk's Adventure, Super Mario World, F-Zero.



1993
Notable Releases: Ridge Racer, Star Fox, Virtua Fighter, Atari Jaguar 300



1994
Notable Releases: Killer Instinct, Virtua Fighter, Earthworm Jim



1996
Nintendo releases the N64. The last significant cartridge based home console was released in colors, it sold 33 million units sold

Other Releases: Resident Evil, Crash Bandicoot, Sega Super GT



1994
Nintendo releases the Gameboy Color

Other Releases: Rainbow Six, Metal Gear Solid, Nemegears



2000
Sony releases the PS2, 136 million units sold and is the best selling console to date

Other Releases: Perfect Dark, Chrono Cross, Shies of Arcadia



2004
Sony releases the first handheld console to use an optical disc, the Playstation Portable

With their first venture into the video game console market, Microsoft releases the XBOX, 24 million units sold



2005
Microsoft releases its second console, the XBOX 360

Other Releases: Gran Turismo 4, Guitar Hero



2009
Nintendo releases the Nintendo DSi and Sony releases the PSP Go.

Other Releases: Gran Turismo 4, Guitar Hero

1st Generation

2nd Generation

3rd Generation

4th Generation

5th Generation

6th Generation

7th Generation



1967
German-born television engineer Ralf Baer and his coworkers design the first video-game console that works on a standard television and dub it, "Brown Box". They develop a chase game, allowing players to control two squares chasing each other on the screen. A modified toy gun is made and able to distinguish spots of light on the screen. 12 Other games are made



1972
One of the earliest arcade video games, PONG, is a simple tennis game that became the first commercially successful video game



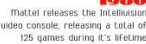
1976
Atari releases Breakout. The prototype was designed by Apple cofounders Steve Jobs and Steve Wozniak. Breakout's current variant is called Brick Breaker



1977
Atari opens the First Pizza Time Theatre (later Chuck E. Cheese's), a video arcade pizzaeria



1977
Atari releases the Video Game Computer System (Atari 2600 or VCS). It is the most successful video game console of its time



1980
Mattel releases the Intellivision video console, releasing a total of 125 games during it's lifetime



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1978
Notable Releases: Space Invaders, Bee Gee



1982
Notable Releases: Q-Bert, Tron, Megaman, Big Dog, Pole Position, Joust.



1983
Sega Releases the SG-1000 to the Japanese market, finding only minor success



1985
Nintendo releases the NES in the US. Super Mario Bros. is released and sells 10 million copies before year's end, eventually being the top-selling video game until 2008 with 40 million copies sold



1986
Sega releases the Sega Master System as a competitor to the NES.



1987
Notable Releases: Mega Man, Street Fighter, Metal Gear, Final Lap, Castlevania, Contra, Final Fantasy, Phantasy Star, Maniac Mansion



1991
Notable Releases: Road Rash, Street Fighter II, Tecmo Super Bowl, Sonic the Hedgehog, Sega CD



1989
Bundled with Tetris, Nintendo Releases the Game Boy and is an instant success, selling 188 million world wide

Also Released: Power Glove, TurboGrafx-16, Prince of Persia



1992
Notable Releases: Mortal Kombat, Virtua Racing, Herby's Dream Land, Mario Kart, Air Combat, Philips CD-i



1994
Sony releases the PlayStation Console and is heavily influences the end of the cartridge, 125 million units sold

Other Releases: Sega Saturn, Neo Geo CD, Sega 32X



1997
Notable Releases: Goldeneye 007, Final Fantasy 7, Outlander, Grand Theft Auto, Gran Turismo



1999
Sega releases the Dreamcast. Considered to be ahead of its time and the pioneer of online gaming, the Dreamcast sold 10.6 million units

Other Releases: Paper Mario, Break Mary Cry, Halo



2001
Nintendo releases the Gameboy Advance. With several different variants and colors, 81 million are sold

Other Releases: Paper Mario, Break Mary Cry, Halo

2001
Nintendo releases the Gamecube, Nintendo's first console to use optical discs, 21 million units sold

Other Releases: Fable, Halo 2

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2002
Notable Releases: SOCOM, Animal Crossing, Kingdom Hearts, Vice City, Splinter Cell, Medal of Honor



2004
Nintendo releases the Nintendo DS sporting a touchscreen and stylus

Other Releases: Fable, Halo 2

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2006
The Sony Playstation 3 and the Nintendo Wii are released just 8 days apart from each other, both enter the 3 way console war

Other Releases: Fable, Halo 2



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Our Intervention





Methods

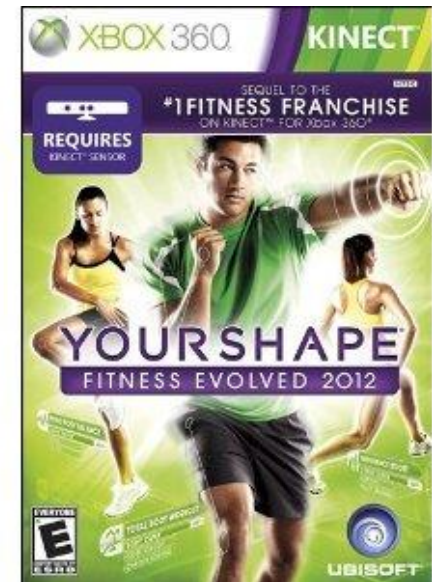
- **Pilot study – 10 patients**
- **8-week active video gaming exercise program**
- **Baseline + end-of-study assessment**
 - **SF 36**
 - **Godin Leisure Time Exercise Questionnaire**
 - **BP**
 - **6-minute walk test**
- **Midway call**



Gaming Console

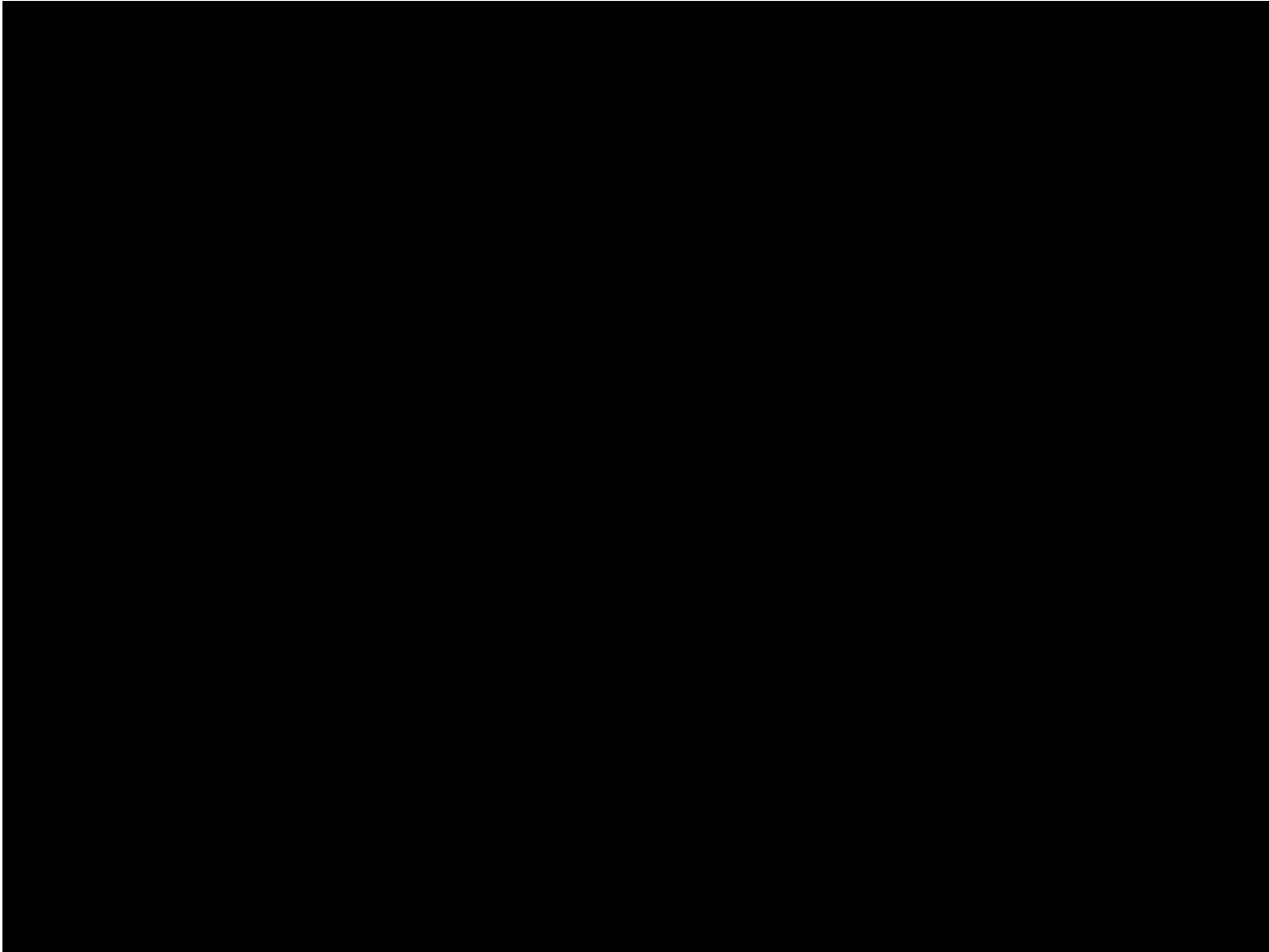


KINECT
for Xbox 360.



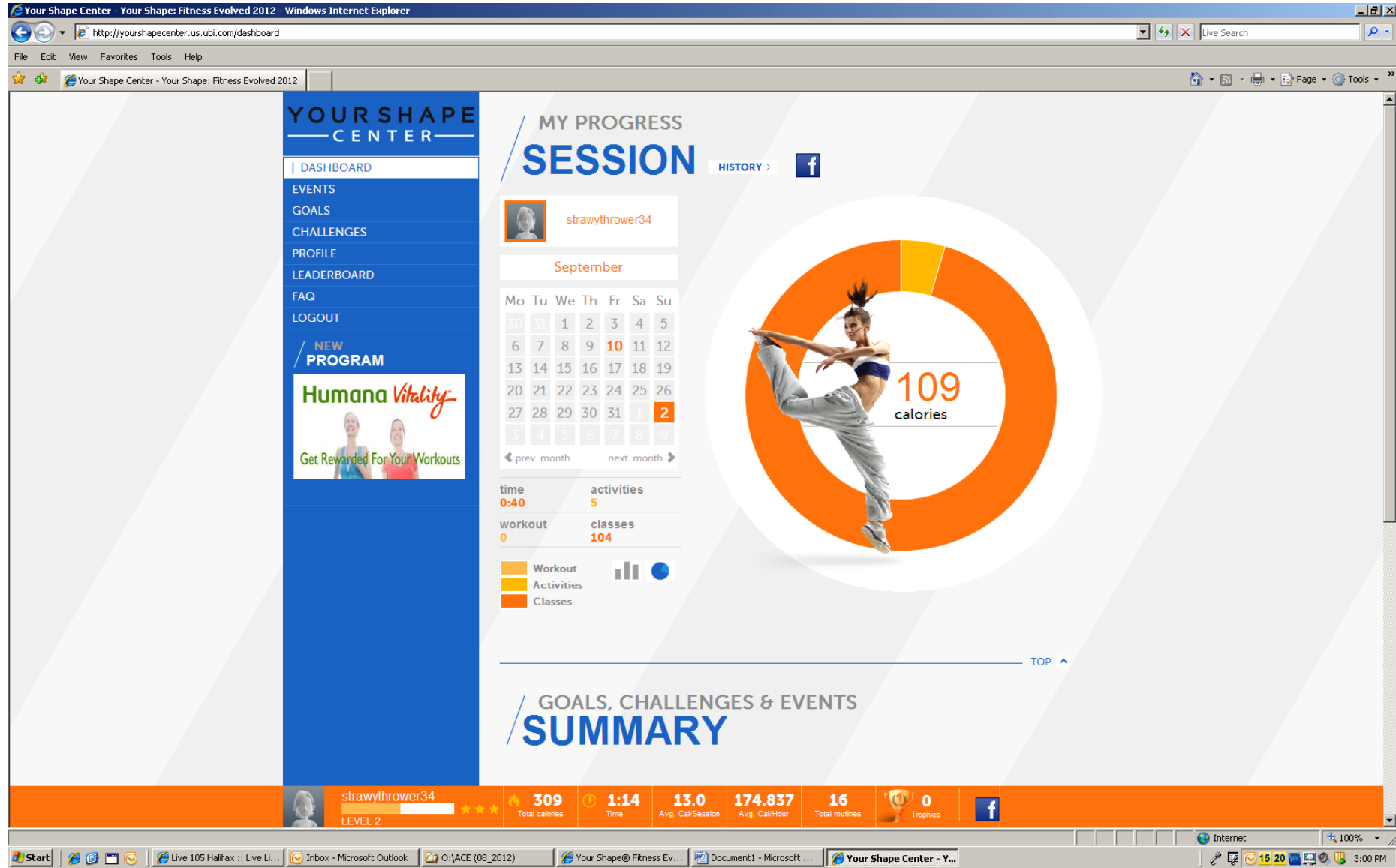


What does it look like?





Capturing of Exercise Information





What do patients think so far

- “..**enjoying the system** as it has allowed me to exercise in the air conditioned house” (age 65)
- “I have been doing the exercises in addition to my regular walking and am **noticing a difference already**” (age 72)
- “I have needed to **modify a few of the exercises** due to my hip stiffness; the system doesn’t like it when it can’t fully see me, but it does still logs the time in. I have been keeping good track on the exercise diary just in case” (age 63)
- “I tried the unit for 2 weeks and I can tell **it is not for me**. I will not use it to exercise as it just feels too awkward” (age 41)



Thank you

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