Making Technology Accessible for Low Vision Patients

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Disclosure Statement:
• Nothing to disclose

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Abstract:

- This presentation will discuss how computers, e-readers, and tablets can be adapted for successful use by the visually impaired. Specific emphasis will be placed on PC computers, the Kindle e-reader, and the iPad.

Learning objectives:

- To understand the medical and visual characteristics of patients that can benefit from adaptations to new technology.
- To provide simplified steps that can be both demonstrated and given to low vision patients for computers, e-readers, and tablets.
- To explain different features, helpful apps and accessories that can be utilized.
- To discuss resources for continued learning with regards to accessibility options for the aforementioned devices.
Let’s talk about Low Vision & Blindness

- Low Vision Defined:
  - Decrease in visual acuity, visual field or visual function that leads to visual disability
  - Moderate visual impairment: <20/60
  - Severe visual impairment: <20/160
  - Profound visual impairment: <20/400
  - Near Total visual impairment: <20/1000
  - Total visual impairment: NLP

Legal Blindness as defined by the SSA:
- Visual acuity of 20/200 or worse in the better seeing eye or a visual field of less than 20 degrees at the widest diameter
Visual impairment and blindness statistics

• A 2012 report by the National Institutes of Health estimates that 2.9 million Americans are living with low vision
  – This number is expected to increase 72% by 2030
  – Most people with low vision are 65 years old or older
  – The chief causes of vision loss of older people are age-related macular degeneration (AMD), diabetic retinopathy, cataract, and glaucoma
  – Among younger Americans, low vision is most often caused by inherited eye conditions, infectious and autoimmune eye disease, or trauma

• Globally the overall increase in the number of people suffering from blindness and vision loss is due to the huge population explosion that has occurred during the last couple of decades

• The prevalence of non-refractive visual impairment increased 21% overall among US adults ages 20+, and 40% among non-Hispanic whites ages 20-39
Most Common Eye Diseases seen in a Low Vision Clinic

• Age-Related Macular Degeneration
  – Dry
  – Wet
• Diabetic Retinopathy
• Glaucoma
• Retinitis Pigmentosa and other Hereditary Retinal Dystrophies
• Optic neuropathies
• Neurological cases
Neurological cases

- Acquired Brain Injury (Stroke)
- Traumatic Brain Injury (motor vehicle accident)
- Cortical Visual Impairment (visual dysfunction is caused by damage or injury to the brain; no associated ocular disease)
- Oftentimes have deficits in: visual field (hemianopsias), visual processing, accommodation, and many more
Computer Accessibility Options

- A way for patient to customize the computer for their vision (some limitations)
- PC computers using Microsoft Windows operating systems
  - Windows XP
    - although no longer supported i.e. updates, etc.
  - Windows Vista
  - Windows 7
  - Windows 8 (newest)
    - can change operating system over to Windows 7 layout
- Included (free!)
What can be changed (in general) using computer accessibility options?

– Font
– Contrast
– Size of text and icons on the screen
– Blinking cursor
– Mouse pointer
Computer accessibility options - limitations

- Font size can be increased up to 200% (equivalent of 1x magnification)
- Contrast can be changed only to reverse polarity (white print on a black background)
  - Issues arise with different webpages
    - Those with colored text/fonts make them difficult to see/reduced visibility
    - Patterns of colors with menus, text boxes, etc. are colored differently than the white main text
Computer accessibility options – limitations, continued

– Navigation is more difficult
  • Patients have to use the scroll bars more frequently
– Field of view is smaller
  • Some of the pictures/text may be missing
– Reformats the position of icons on the home screen
– Some webpages can not format the enlarged fonts and you have cross-over of text on text
– Unable to change contrast/colors of background and cursor/pointer (only one option)
Making the Internet more accessible

- Pair accessibility options with browser for internet usage
- Use control +/- to zoom in and out easily on different webpages or access the zoom with icons located on right hand upper or lower corner of screen dependent on operating system
- Customize email with incoming/outgoing messages defaulting to a specific font size and type
Accessibility options - Steps for Windows XP

• Changing/enlarging display settings:
  – Right click once on the Desktop background where there is no icon
  – Left click once on Appearance tab.
  – Change Windows and Buttons: pull-down to Windows Classic Style.
  – Go to Color Scheme pull down and choose either High Contrast White or High Contrast Black (you’ll see the color changes, many choose White).
Accessibility options - Steps for Windows XP, continued

• Go to **Font Size** pull down and choose font size to Large or Extra Large. **CLICK ON APPLY TO SAVE ALL CHANGES SO FAR.**

• Click on **Effects** button, and it opens another box where you can change the size of the Icons. Check the **Use Large Icons** box, and **BE SURE TO CLICK OK TO SAVE THIS.**

• **OPTIONAL:** Only if you are very comfortable changing settings, you could click on **Advanced** button which opens another box where you have option to pull up different items relating to window and further customize changing font, size, color. Sometimes, by changing icon spacing you can get more of the titles for desktop icons to show because they tend to be cut off when enlarging font. If you choose to experiment in this box, remember to **CLICK OK** to save changes.)
Accessibility options - Steps for Windows XP, continued

• Another way to make desktop easier to see is to change the desktop background color. Left click on Desktop tab in the Display Properties box. Go to Background pull down and choose (None). Then go to Color pull down and choose any background color that would be a good visual contrast on desktop that client prefers (colors are displayed as you explore them). When you make a final choice, be sure to click OK to save setting.

• When you finalize all your settings, save this theme by following instructions for Saving Original Settings; but his time, instead of typing client’s initials at end of My Favorite Theme File Name, type in words like, Large Print, so that this theme will be easy to restore if changed by someone else.
From Start Menu, go to Control Panel, and open up Mouse file.
Click on Pointers Tab in Mouse Properties Dialogue Box.
Notice current Scheme name in case you want to restore it later.
Open Scheme and select mouse pointer setting.
Click Save As and add client initials to end of scheme name.
Click OK in Save Scheme message box.
Click OK in Mouse Properties Pointers Page.
If you want to use a circular, visual, pointer locator, click on Pointer Options Tab at top.
Check “Show location of pointer when I press CTRL key.”
Then click OK button.
Other points about accessibility options in Windows XP

• Can also use the Accessibility Wizard
  – However, individual options can be confusing to choose and then later adjust while exploring different settings.
• Find Accessibility Wizard at the following path: Start Menu/Programs -> Accessories -> Accessibility -> Accessibility Wizard
• If you choose to use Wizard, you should first save the original settings because it can be confusing as to how to change back to original settings once you make changes via Wizard.
• If you use the Wizard, we’ve found it best NOT to use the Magnification program for most patients because it can be very difficult and disorienting without a lot of instruction and practice.
Accessibility options - Steps for Windows Vista

• Open the start menu.
• Open the control panel.
• Open the ‘ease of access center’. Not everything in this ‘center’ will be applicable to you. The most common adjustments for low vision will be highlighted.
• If you wish to evaluate contrast options, click on ‘choose a high contrast color scheme’. This will open the ‘appearance settings’ box where you can choose whichever color scheme is best. Once you’ve made your choice, click apply and okay after the changes have saved.
Accessibility options - Steps for Windows Vista, continued

• If you wish to make things on the screen larger, click on ‘change the size of text and icons’. A DPI scaling box will open. Choose the larger scale and click OK.

• If you have trouble seeing the blinking cursor, choose a width from the drop down menu. You can preview this as you choose.

• If you require further changes be made, click on ‘personalize appearance and sound effects’ and a new window will open.
Accessibility options - Steps for Windows Vista, continued

• You will see a list of things that can be changed based on your personal preference. Again – only the common adjustments for low vision will be highlighted.

• If you have trouble seeing the mouse pointer, click on ‘mouse pointers’. A ‘mouse properties’ box will open with the ‘pointers’ tab being displayed. In the ‘scheme’ drop down menu a variety of larger, high contrast pointers are available. Choose the one you see best and click on apply and once it’s saved click OK. The ‘pointer options’ tab will allow you to change the pointer speed as you move it across the screen and/or create trails to follow the pointer more easily. Experiment and see if any of these changes work for you. Once you’ve chosen, save the changes.
Accessibility options - Steps for Windows 7

• Open the start menu.
• Open the ‘control panel’.
• Click on ‘appearance and personalization’. Not everything in this menu will be applicable to you. The most common adjustments for low vision will be highlighted in this handout.
• If you’d like to change the size of your font, select ‘display’. You can choose a small, medium, or large font. Once you’ve made a selection, click on ‘apply’.
Accessibility options - Steps for Windows 7, continued

• Click on ‘ease of access center’. Again – not everything in this ‘center’ will be applicable to you. The most common adjustments for low vision will be highlighted.

• Click on ‘make the computer easier to see’.

• If you wish to evaluate contrast options, click on ‘choose a high contrast color scheme. This will open the ‘appearance settings’ box where you can choose whichever color scheme is best. Once you’ve made your choice, click apply and okay after the changes have saved.
Accessibility options - Steps for Windows 7, continued

• If you wish to make things on the screen larger, click on ‘change the size of text and icons’. You will then be prompted to choose a small, medium, or large font. Once you’ve made your selection, click ‘apply’.

• If you have trouble seeing the blinking cursor, choose a width from the drop down menu. You can preview this as you choose.

• Once you’ve finished on this page, clicking ‘apply’ and ‘OK’ will save all changes and bring you back to the previous page.
Accessibility options - Steps for Windows 7, continued

• If you have trouble seeing the mouse pointer, click ‘make the mouse easier to use’. You can choose which looks best to you. After you’ve made your choice click ‘apply’ and then ‘OK’.

• If you require further changes be made to the mouse pointer, go to the bottom of the page under ‘see also’ and click on ‘mouse settings’. The will open a ‘mouse properties’ box to the ‘pointer options’ tab. Choose a mouse speed and tails to follow the mouse if you choose. Click ‘apply’ and ‘OK’ to save your changes.
Accessibility options – Steps for Windows 8

• One aspect of Windows 8 is the introduction of touch-only devices. With touch devices you can directly interact with everything on your screen by touch, without using a keyboard or mouse.

• In Windows 8, many of the most commonly used accessibility options are available from the sign-in screen including Magnifier, High Contrast and Narrator.

• Click the Ease of Access button in the lower left corner of your screen to choose the settings you want to have available each time you start your computer.
Accessibility options – Steps for Windows 8, continued

• You can find more settings on the **Ease of Access** page. From the Start screen:
  • **Using the keyboard:** Open the page by pressing the **Windows logo key + U**.
  • **Using a touch enabled device:** swipe in from the right edge of the screen, then tap **Search**.
  • **Using a mouse:** point to the upper-right corner of the screen, move the mouse pointer down, and then click **Search**.
Accessibility options – Steps for Windows 8, continued

• Next, Enter Ease of Access in the search box, click or tap on Settings, and then click or tap Ease of Access in the results.

• Magnifier:
  • Magnifier is a tool that enlarges your screen, or portions of your screen, making words and images easier to see. Magnifier makes it easier to see the screen and touch it too. If you use a touch enabled device you can control Magnifier from the edges of your screen, and can easily enlarge or reduce the size of the Magnifier window by touching buttons on the screen.
Accessibility options – Steps for Windows 8, continued

• **Narrator:**
  • Narrator is a screen reader that reads aloud the text that appears on the screen. Narrator also describes events such as error messages.

• **Change Text Size:**
  • Make text and icons larger and easier to see without changing the screen resolution.

• **Speech Recognition:**
  • Compose documents and email, and surf the Web by dictating and speaking the commands rather than using a keyboard or mouse.

• **Personalization:**
  • Change settings such as theme, color, sounds, desktop background, screen saver and font size.
Other points about accessibility in Windows 8

• Other features available:
  – On-Screen Keyboard
  – Keyboard short-cuts
  – Sticky Keys
  – Mouse Keys
  – Filter Keys
  – Visual notifications (for persons with hearing loss)
Characteristics of patients that can benefit from PC accessibility options

- Patients with visual acuity up to around 20/100 or 20/125 (2M to 2.5M near acuities)
- From our experience, visual field loss from Glaucoma, RP, etc. typically is not a factor in precluding patients from using computer accessibility options
Other options

• For patients with more severe vision loss:
  – Utilize screen magnification software
    • ZoomText, e.g.

• For patients with little to no remaining vision:
  – Screen readers
    • JAWS, MAGic, e.g.

• All of these programs require additional training, usually with a Certified Vision Rehabilitation Therapist (CVRT) or an Assistive Technology (AT) specialist
The Amazon Kindle e-reader

- Types of Kindle readers available
  - Kindle 6” glare-free touchscreen display ($79)
  - Kindle Paperwhite ($119; 3G version $189)
  - Kindle Voyage ($199; 3G version $269; has adaptive built-in light)
  - Kindle Fire HD 6 ($99)
  - Kindle Fire HD 7 ($139)
  - Kindle Fire HDX ($199 for 7” screen; $379 for 8.9” screen)

- Older Kindles
  - Original Kindle (not touchscreen)
  - Kindle DX
  - Kindle Fire
Kindle e-reader accessibility

• Settings/features for visual accessibility on the Kindle Fire models
  • Screen magnifier
  • Font Size
  • Contrast
  – Other features
    – Screen reader
    – Adjustable reading speed
    – Explore by touch
    – Accessibility User’s Guide available
Kindle e-reader accessibility – new features

• Improved Large Font mode with two larger system font options.
• Central interface for setting closed captions style, including text color, size, opacity, font style, edge style, background color, and more, for Amazon Instant Videos, web videos in the Silk Browser, and email video downloads.
• Screen Reader support for five more device languages, including German, French, Italian, Spain, and Portuguese.
• Faster reading speed options for Screen Reader.
• New Screen Reader features and user preferences, including independent volume controls, audio ducking and a configurable reading level gesture.
Kindle e-reader accessibility - limitations

• On the older models can only adjust the following:
  – Font size, typeface, line spacing, words per line, screen rotation

• Good resource
  
The Apple iPad

• iPad (pricing ranges from $399-$529)
  • Available with and without retina display
• iPad Air (pricing ranges from $499-$929)
• iPad Mini (pricing ranges from $399-$829)
  • Available with and without retina display
The Apple iPad, continued

• Considerations with the iPad for the low vision user
  – Different generations circulating
    • Older generations may not have a camera
  – Updates change accessibility features (iOS6 vs. iOS7 vs. iOS8, e.g.)
    • Good resources pertaining to the most recent changes in iOS8:
      • https://nfb.org/blog/atblog/what%E2%80%99s-new-accessibility-blindlow-vision-and-deaf-blind-users
iPad accessibility features

- **iOS6**
  - Voiceover
  - Zoom
  - Large Text
  - Invert colors
  - Speak Selection
  - Speak Auto–text

- **iOS7 & iOS8**
  - All of the above plus:
    - Larger type
    - Bold text (in iOS8 – under General->Display and Brightness)
    - Increase contrast (more options in iOS8)
    - Reduce motion
    - Note – Siri: new development takes more commands; now have “Hey Siri” feature to use it hands-free
Zoom

- Zoom magnifies the entire screen
- Zoom is controlled using a series of triple finger gestures once enabled (in iOS8 – zoom slider)
  - Double-tap three fingers to zoom
  - Drag three fingers to move around the screen
  - Double-tap three fingers and drag to change zoom
Large Text

- View larger in Mail, Contacts, Calendars, Messages, Reminders, and Notes
  - 20 pt
  - 24 pt
  - 32 pt
  - 40 pt
  - 48 pt
  - 56 pt
Invert Colors

- Black background with white text and orange highlighting once enabled
Other accessibility options

- **Speak Selection**
  - Once enabled, a speak button will appear when you select text
  - In iOS8 – “Speak it to me” feature where low vision users can “read” the screen only
    - Two finger pull down gesture to use this feature on Safari
    - To turn on this setting: General->Accessibility->Speech-> Speak screen

- **Hearing**
  - Enable/disable mono audio
  - Adjust audio volume balance between right and left channels

- **Video description in iOS8**

- **Guided Access**
  - iPad stays in a single app
  - Allows user to control which features are available

- **Physical and Motor:**
  - Assistive Touch - user can adapt iPad if they have difficulty touching the screen or if they require an adaptive accessory
  - Custom Gestures – user can create specific to the user’s needs
  - Triple Click Home - use the home button for the following options:
    - VoiceOver
    - Invert Colors
    - Zoom
    - Assistive Touch
Other Accessibility Options, continued

• Using the reader option on Safari*
  *Available on iOS6 and previous operating systems, discontinued in later versions

• Using Reverse Pinch option in the following areas:
  – Internet
  – Maps
  – App specific – some apps will allow you to do this, and some will not.
  – Mail
    • Not available within mailboxes or when composing or replying to an email.
  – Using Apps
    • Free vs. Paid
  – Using iPad as video magnifier

• New update starting in iOS7 on Safari
  – “Paragraph” icon in the upper left-hand corner beside website address
    • Can be selected to remove graphics of an article, make it larger text, and high contrast
Using Reader on Safari*

- Not available on all sites
- Must be in an article of text
- If available, will have shaded box on right of URL bar named “reader”
- Removes pictures for less visual clutter
- Left aligns all text
- Allows for enlarged font size similar to iBooks (Not having to access zoom features makes navigation easier)
Apps applicable for low vision patients

- Magnifiers
- Money identifiers
- Flashlights
- Color Identifiers
- E-book Readers
- ViA – Created by The Braille Bible Institute; offers apps that have been tested by persons with low vision.
- Brain teasers and games (word search, crosswords, etc.)
- Vision Simulators
- Writing and Dictation
- Eye disease screeners
- Visual Motor, Reaction, Attention Exercises - Visual Perceptual skills

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More Apps

Free Apps
- Brighter Bigger
- Kindle E-Reader
- Readability
- ibooks
- VisionSim
- Large High-Contrast Clock
- Jumbo Calculator
- Touch Bible or Bible Gateway
- RxmindMe Prescription/Medicine Reminder and Pill Tracker
- Sayit Colors
- Low Vision Center
- Flashlight
- Ultimate Word Search
- EyeNote
- Talking Goggles – more on audio side
- Tap Tap See – more on audio side
- QRReader
- Mag Light

Paid Apps
- EyeSight $29.99
- Zoom Contacts $4.99
- Read2Go $19.99
- ZoomReader $19.99
- Mag. Light Pro $1.99
- ColorVisor $4.99
- LookTel Money Reader $9.99
- Light Detector $0.99
- Voice Dream $9.99
- Navidys $2.99
- MusicZoom $20
Accessories to use the iPad as a visual tool

- Stands including reading stands
- Stylus
- External keyboards
- Large Print stickers/tactile markings/bump dots
- Absorptive filters
- Lighting
- Reading glasses
- Loupes
- Typoscopes
Resources for Low Vision Users

- Web Accessibility Initiative (WAI)
- iPad User Guide
- Lioncourt.com
- ATMac.org
- Assistivegaming.com
- AppleVis: Accessible apps, guides & discussion for blind and vision-impaired users of Apple devices www.applevis.com
- http://appadvice.com/applists/show/apps-for-the-visually-impaired
Eye Disease Characteristics & Functional implications for iPad usage

Central scotomas & metamorphopsias (Age-Related Macular Degeneration, Diabetic Retinopathy)

Peripheral vision loss (End-stage Glaucoma, RP, Diabetic Retinopathy s/p PRP)

Hemianopsias or visual field defects (Neurological cases, Glaucoma, Optic Neuropathy)
Level of Vision Loss & Functional implications for iPad usage

Moderate Vision Loss
- Visual acuity of 20/63- to 20/200+
- 60 degrees visual field with hemianopsias
- Relative scotomas in central/paracentral visual field
- Metamorphopsias

Severe Vision Loss
- Visual acuity of 20/200 to 20/400-
- 20 degrees visual field
- Absolute/dense scotomas
- No macular sparing

Profound Vision Loss
- Visual acuity of 20/500 to 20/1000
- 12 degrees visual field

iPad accessibility options

iPad as a video magnifier and zoom options with apps

iPad Voiceover and blindness apps

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Conclusions

• The number of visually impaired and blind patients in the United States is rising, as is the need and request for technology in this population

• As discussed in this presentation, numerous changes can be made to customize PC computers, e-readers such as the Kindle, and tablets such as the iPad for a patient’s level of vision

• Thanks to the many new advances in technology, patients who are visually impaired or blind are now able to access the same materials as normally sighted people
Sources


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Please complete your session evaluation using EyeMAP™ online at [http://aao-eyemap.org](http://aao-eyemap.org)

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