PATIENT ENGAGEMENT TABLET
Educating patients on health conditions and treatment options
Utilizing technology for personalized care

Today, healthcare providers are looking for effective patient engagement strategies. To achieve improvements in outcomes, providers need to engage patients in a personalized way and encourage them to take an active role in their well-being. Part of the answer is to improve clinician-to-patient communication—regardless of the level of medical knowledge by patients or their loved ones participating in their care.

Healthcare organizations have an opportunity to create more effective interactions and improve the quality of patient care by using the same mobile technology that people are familiar with in their everyday lives and bringing it into the clinical setting. Clinical tablets with the right solution set can deliver a graphical and interactive method to explain human anatomy, medical conditions, and recommended treatment options.

3D4Medical Essential Anatomy* is an award-winning application that answers this challenge. When combined with an Intel®-based Windows® 8.1 tablet such as the Microsoft Surface Pro® 3, the full patient engagement solution can be deployed in any healthcare setting, resulting in improved communication and better-informed decisions.

3D4Medical Essential Anatomy improves clinician-to-patient communication regardless of the patient’s level of medical knowledge.
Conveying health conditions and treatments

While many healthcare providers have adopted electronic records and systems for use among staff, they still need a better way to convey health problems and corresponding treatment options to patients. Clinicians need to describe the affected portions of a patient’s anatomy, regularly using technical terms, while explaining medical procedures and treatment strategies. This is true for all medical disciplines, including primary care, orthopedics, neural surgery, oncology, and numerous specialists focused on the various anatomical subsystems of the human body.

Traditional communication methods are often inadequate. Posters in the doctor’s office can be awkward and are only two-dimensional. Sometimes doctors are forced to draw rudimentary pictures on a sheet of paper or white marker board. Medical texts and journals contain the right information but they are highly technical and meant for a doctor’s use, not patient education. These methods are short of ideal, make conversations more difficult, and potentially add stress to an emotionally difficult situation. There is a real need to enhance patient communication.

Healthcare providers can take the patient experience to a new level, untethering technology so it can be used flexibly at the point of care. With the right solution, staff members can better educate patients anytime, anywhere and hold more productive patient consultations. Such a patient engagement device can be a powerful tool if the information contained in it is up to date and includes the necessary detail for all the anatomical subsystems listed in Figure 1, thus covering a large number of medical disciplines.

Figure 1. Anatomical subsystems of the human body
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Revolutionary technology for patient communication

Healthcare organizations can transform the patient experience by deploying the 3D4Medical Essential Anatomy application on Microsoft Surface Pro 3 tablets across their medical staff. This solution puts a highly interactive anatomical visual dictionary in the hands of mobile health workers. The tablets can then be used across multiple locations, including doctors’ offices, consultation rooms, exam/procedure rooms, and even house calls.

Through Essential Anatomy, medical practitioners can manipulate and explore detailed anatomical structures. The interface provides a fully diagrammed human body from which users can peel back layers and rotate images to reveal deeper structures. Additional details about this app are covered in the Software Considerations section of this document.

Essential Anatomy performs exceptionally well on the Microsoft Surface Pro 3 tablet, which offers responsive touch functionality and the power to quickly process complex graphical images from any viewing angle.

The tablet offers a high-definition (HD) screen that captures every detail of the three-dimensional anatomical images contained in the app. In addition, the Surface Pro 3 form factor with 12-inch display is ideal for viewing by multiple people, as in a doctor-to-patient consultation. The proposed solution is shown in Figure 2.
3D4Medical Essential Anatomy

Essential Anatomy provides a powerful and comprehensive three-dimensional representation of the human body. The app is designed to deliver a touch-optimized seamless and fluid experience to the user. 3D4Medical’s custom-built anatomical models and proprietary real-time 3-D graphics engine allow for an excellent level of detail and exceptional performance.

Microsoft Surface Pro 3 Tablet

The Surface Pro 3 has all the power and performance of a laptop, but in an incredibly thin and lightweight magnesium form factor. This tablet is ideal for running Essential Anatomy and sharing visual information with patients through a fluid multi-touch experience, large 12-inch HD display, and a convenient built-in, multi-angle kickstand for hands-free support.

Microsoft Windows 8.1 Pro

Windows 8.1 Pro* is a 64-bit mobility-optimized operating system that also delivers the security and manageability features desired by technology deployment teams. Windows 8.1 capabilities include a compelling touch screen user interface, powerful application support, and low power optimizations.

Intel® Core™ i7 Processor

A 4th generation Intel® Core™ i7 processor delivers performance for a highly responsive touch screen experience and exceptional 3-D graphics as required by this application. Balancing performance with low power, the processor enables thinner and lighter systems with longer battery life.
Outstanding performance in a tablet

The 4th generation Intel Core i7 processor is available in various configurations, including the U-series present in the Surface Pro 3 tablet. This version balances performance and power for a zero-compromise computing experience. For instance, Intel® Turbo Boost Technology 2.0 dynamically controls both processor cores and graphics to provide performance where and when it is needed and save energy when it counts. Intel® Hyper-Threading Technology delivers two processing threads per physical core; in the Surface Pro 3 that manifests itself in four threads that can accomplish more by working in parallel to complete tasks sooner.

The U-series also supports Windows 8 Connected Standby for long battery life so the tablet can do useful work even in a low power state. For running graphics-intensive programs such as Essential Anatomy, the Intel Core i7 processor features Intel® HD Graphics, which let you see the smallest details, along with Intel® Iris™ Graphics for stunning 3-D visuals.

These Intel graphics technologies drive a beautiful 12-inch Microsoft ClearType* Full HD Plus display with a 2160 x 1440 pixel resolution. The large screen of the Surface Pro 3 makes it easy to view anatomical structures in sufficient size and resolution for clinicians to share with patients and point out vividly rendered details.

The screen is large enough for viewing by two people whether it is the doctor and the patient or the patient plus a loved one. The Surface Pro 3 also supports wireless display technology through Miracast®, so its onscreen images can be projected to a much larger display for group viewing if needed. To navigate through the Essential Anatomy app, the screen supports multi-touch, which is key for enlarging and rotating images as part of the patient conversation.

Finally, at just 0.36-inches thin and 1.76 pounds, the Surface Pro 3 is easy to carry around for doctor-patient consultations anytime, anywhere. The built-in kickstand also makes it possible for a caregiver to easily prop up the tablet on a desk during the consultation session, and the included Surface pen lets the user annotate anatomical views and save the notes for future reference.

The Surface Pro 3 stands out for this patient engagement use case because of the processor, the screen, and its mechanical design.
Application features and operation

Essential Anatomy incorporates a vast library depicting nearly every biological detail of the human body. Its features enable a clinician to isolate and analyze various anatomical subsystems as shown in Figure 3: skeletal, muscular, nervous, cardiovascular, respiratory, digestive, urinary, and lymphatic.

Using the menu on the left side of Figure 3, each anatomical subsystem can be independently added or removed from view. For the muscular subsystem, muscles are grouped in layers for easier navigation, while arteries and veins are also dealt with independently on the user interface. A convenient navigation path at the top of the screen tracks the directory path or classification for a tapped anatomical component.

Figure 3. Example screenshot of Essential Anatomy
Each anatomical structure can be magnified and rotated for examination in detail from any angle. Magnification is done through the multi-touch function by sliding two fingers on the screen in opposite directions. Panning also uses multi-touch, but the user drags two fingers in the same direction to position the image. Image rotation is done with a one-finger drag anywhere on the screen to achieve the desired viewing angle.

This flexibility in image manipulation, along with the ability to remove anatomical layers, enables the user to display impressive see-through views that allow access to hidden details. For example, tapping on an image results in a submenu of options for the outermost layer, organ, or tissue currently at that tapped location on the screen, as shown in Figure 4.

**Figure 4.** Essential Anatomy submenu for tapped anatomical component
This item menu contains an audio English pronunciation, Latin nomenclature, and a detailed description of the anatomical component. This submenu also provides additional options for isolating, fading, or hiding anatomical elements.

Buttons on the lower right of the screen activate a variety of functions and tools:

- Touching the Refresh button restores any structures that may have been hidden by the user during exploration of deeper layers of the model. The model stays in the same position as before the reset.
- The Multiple button enables users to compare numerous structures by placing more than one on the screen at the same time.
- The Control Menu button allows the user to make detailed selections on which systems and structures are visible. For example, the user can touch a particular muscle to highlight it and then subtract other muscles from the view.
- With the Bookmark button, the user can create and save custom views. The button brings up a text box and virtual keyboard that let the user enter a name for the view. To revisit that view, the user taps the Bookmark button again and then selects the name of the view.
- The Search button brings up a text box and keyboard. The user types in the first couple of letters of the desired anatomical structure, and then the Search function finds and presents that structure.
- Touching the Markup button allows the user to draw or annotate a view on the screen.
- The Share button has options for e-mailing, saving, or sharing the current onscreen image through social media.

The flexible image manipulation in Essential Anatomy enables the user to display impressive views.
Optimizing the application

The deep levels of detail in the anatomical models and the rich capabilities for manipulating them place enormous demands on the purpose-built 3-D rendering engine in the application. Keeping up with 3D4Medical high user-experience standards requires real-time rendering and fluid visual movement through the models, while also smoothly supporting other elements of the app, such as the rich user interface and reference material.

To help ensure fast, smooth operation on the tablet, 3D4Medical software developers used the following rendering optimizations to reduce the calculation overhead:

- Skipped drawing the far side of each model if it was not visible
- Drew anatomical parts nearest to farthest so when some parts visibly overlapped, the parts in back would require less processing
- Reduced texture sizes to decrease video memory usage and improve memory read/write speeds
- Organized models in a hierarchy, so if an anatomical part was offscreen, its components such as bones or muscles did not need to be calculated
- Where possible, performed calculations first on the Intel Core i7 processor and then passed the results to a graphics processing unit (GPU)

Engaging with 3D4Medical, Intel application engineers used Intel® Graphics Performance Analyzers to discover further opportunities for performance improvements. For example, in a scene where blending was not required, disabling blending resulted in a significant frame-rate increase. In another instance, performance was improved by modifying the rasterizer state to eliminate unnecessary compute cycles.

The 3D4Medical 3-D engine along with Intel optimizations result in great graphics performance.
Touch-enabled visual exploration

The vast anatomical library within Essential Anatomy can serve a wide variety of medical practices. For example, an orthopedic surgeon might zero in on a 3-D model of the left shoulder to explain to a patient why a given ligament needs repair. Within the app, the doctor can intuitively navigate directly to the problem area or utilize the search function to get there. Icons on the left side of the screen enable the doctor to visually turn on and off different systems of the body. In this case, the practitioner would turn on the skeletal system, navigate to the target area, add the right layers of ligament/muscular tissue, and then rotate the image to provide the desired view as shown in Figure 5.

Figure 5. Left shoulder structure using Essential Anatomy
At this point, the doctor may want to show the nerves in the shoulder area to help explain the source of pain or even critical nerves the doctor must avoid during surgery. The doctor can easily add the area’s nervous system to the image with the push of a button. To isolate the focus ligament for the upcoming surgery, the doctor taps it on the screen. Essential Anatomy highlights it, and a submenu pops up to show the “isolate” option. The resulting isolated image is shown in Figure 6. As a final step, the doctor might bookmark the navigation path to show it more quickly to the next patient with a similar problem.

Figure 6. Isolated shoulder ligament in Essential Anatomy
Getting from test to field trials

Deploying Essential Anatomy is simple, as the application is downloadable directly from the Windows Store on any Windows 8.1 device. Once installed on a clinical tablet, technology decision makers for a given medical facility or discipline should evaluate the product for performance, ease of use, and general fit for their practice.

After evaluation, a healthcare provider may provide some simple usage guidelines or even a training document to shorten the learning curve for users. Navigation techniques—such as when to single tap, when to multi-touch, how to save cross-sectional diagrams, where and how to make annotations, and other capabilities—could be laid out contextually for a given medical practice and even delivered through a training video.

Next, a healthcare provider may conduct a proof of concept over the course of a few weeks and collect feedback from patients on the positive impact of using such a communication tool as part of the medical consultation process.

Finally, the clinical technology decision maker must determine whether broad deployment should occur as a stand-alone, purpose-specific patient engagement tablet or whether the app should be integrated as part of a larger solution suite.

**Deploying Windows 8.1 in healthcare**

Windows 8.1 tablets plug in easily to the current IT infrastructure at healthcare facilities that have used PC technology for decades. These tablets can be deployed and managed using tools such as Windows Intune* and Microsoft System Center Configuration Manager* (SCCM). In addition, the tablets can be joined to an existing Microsoft Active Directory* domain and managed with the same policies as PCs. Windows 8.1 also supports built-in security with features such as Windows Defender*, which offers protection from malware and viruses, and Microsoft BitLocker* technology for encrypting the tablet’s entire solid-state drive. These security features become paramount for expanded uses of clinical mobility tablets, as explored in the Solution Alternatives section of this guide.
Clinical mobility solution

Essential Anatomy does not have to be deployed as a stand-alone app in a purpose-specific device. Because the Microsoft Surface Pro 3 is based on Windows 8.1, the device is compatible with a wealth of mobile point-of-care (MPOC) applications. Essential Anatomy can become part of a full clinical mobility workflow within the same tablet, which could host electronic medical records, insurance billing, hospital scheduling, and prescription ordering, among other MPOC apps. If the medical practice is a fit, the tablet could also contain other selections from the 3D4Medical catalog, including Muscle System Pro* (for physical therapists) or Heart Pro* (for cardiologists).

In addition, this clinical mobility tablet can execute everyday PC tasks such as Web research, document creation, and editing through Microsoft Office* and e-mail. The Intel Core processor can handle a complex workload while the Windows 8.1 operating system can excel at multitasking between all these functions. The Microsoft Surface Pro 3 tablet also supports a detachable keyboard and a docking station—so not only can the user execute touch screen apps on the go, but also perform desktop computing using these optional peripherals.

While this guide featured the Surface Pro 3, Essential Anatomy will run on any Windows 8.1 tablet or 2 in 1 system, also using an Intel Core processor for best performance.

Remote assistance

The Essential Anatomy app can also be purchased by the patients themselves for use in their own home devices. A remote caregiver could then provide step-by-step instructions for accessing the affected anatomical area through the app, thus improving over-the-phone patient communications.

Healthcare and life sciences education

Students at every level can use the proposed solution for anatomy classes and personal education long before they become healthcare professionals. They can better visualize their subject, listen to audio pronunciations of medical terms, annotate and share media, and even take quizzes. Students can do this with the confidence that they are using the same advanced application being used by numerous professionals in their chosen field.
Benefits of deploying the solution

- **Elevates the patient experience** with improved communication, ultimately helping patients take a more active role in their care
- **Maximizes clinician efficiency** by keeping accurate and detailed information at their fingertips while freeing them to conduct patient consultations wherever it is most convenient
- **Integrates workflows** for any healthcare facility that adopts Intel-based Windows 8.1 tablets and makes Essential Anatomy part of a larger clinical mobility strategy

**For more information**

To learn more about 3D4Medical and Essential Anatomy 4, visit [www.3d4medical.com](http://www.3d4medical.com)

Read more about the Microsoft Surface Pro 3 tablet at [www.surface.com/business](http://www.surface.com/business)


To learn more about Intel Core processors, see [http://www.intel.com/core](http://www.intel.com/core)
Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. For more information go to www.intel.com/performance.

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