

INTISARI

PEMBUATAN DAN VALIDASI DESAIN SIMULATOR ANGIOGRAFI KORONER BERBASIS 3D-PRINTING SEBAGAI MEDIA PEMBELAJARAN DIAGNOSTIK ANGIOGRAM KORONER

Mawaris, K., Gharini, P.P.R., Anggrahini, D.W.

Latar belakang : Kompetensi yang harus dimiliki oleh calon dokter spesialis jantung dan pembuluh darah (SpJP) adalah mengerjakan angiografi koroner dengan proyeksi yang baik, memilih sudut pencitraan yang informatif, serta mengevaluasi angiografi koroner normal dan patologis. Kemampuan interpretasi spasial atau diagnostik angiografi koroner merupakan kemampuan yang kompleks untuk dipelajari. Media pembelajaran yang telah dikembangkan berbiaya sangat tinggi dan tidak dapat menyimulasikan mekanisme angiografi koroner secara konkrit, bebas radiasi, portabel, namun hemat biaya.

Tujuan : Membuat dan memvalidasi desain media pembelajaran yang dapat menyimulasikan mekanisme angiografi koroner fluoroskopik secara konkrit, realistis, aman dari radiasi, realistis, portabel, serta hemat biaya sebelum produksi dan uji coba kepada peserta didik.

Metode : Menggunakan sebagian tahap “Research & Development” untuk membuat desain gambar dan model desain fisik media pembelajaran. Validasi ahli anatomi dan ahli teknik (subjek grup I) menggunakan instrumen wawancara, sedangkan validasi ahli dan praktisi prosedur angiografi koroner fluoroskopik (subjek grup II) menggunakan instrumen kuesioner.

Hasil : Komponen desain simulator angiografi koroner fluoroskopik tersusun dari manekin jantung transparan dan koroner opak 3D yang dibentuk dari data CT-scan (CT-scan derived) pasien normal, sinar tampak dan layar yang dihubungkan dalam sistem C-arm (skala diperkecil), serta sirkuit video. Validator terdiri dari ahli anatomi (n=1), ahli teknik instrumentasi (n=1), dokter SpJP intervensi (n=3), *fellow* intervensi (n=2), dan radiografer intervensi (n=3). Skor penilaian seluruh aspek masuk dalam kategori sangat layak (90%). Aspek keterkaitan kurikulum (94%), nilai pendidikan (92%), efisiensi (88%), keakuratan (90%), estetika (80%), ketahanan (83%), keamanan (95%), penyimpanan dan portabilitas (91%), harga (97%). Kesesuaian tampilan angiogram simulasi *right coronary artery* (RCA) memperoleh penilaian sangat sesuai oleh seluruh (100%) subjek grup II, sedangkan tampilan *left coronary artery* (LCA) memperoleh penilaian bervariasi dari cukup sesuai hingga sangat sesuai.

Simpulan : Penelitian dan pengembangan ini menghasilkan sebuah desain media pembelajaran berupa simulator angiografi koroner fluoroskopik yang komponennya terdiri dari bahan berbasis 3D-printing. Desain yang dihasilkan memperoleh validasi ahli dan praktisi dengan kriteria sangat layak sebagai media pembelajaran diagnostik angiogram koroner. Tingkat kesesuaian angiogram simulasi RCA memperoleh penilaian sangat sesuai (validitas muka), sedangkan angiogram simulasi LCA dinilai cukup sesuai dengan beberapa saran perbaikan.

Kata Kunci : Simulator angiografi koroner, validasi media pembelajaran, media pembelajaran 3D-printing, koroner 3D-printing

ABSTRACT

CREATING AND VALIDATING DESIGN OF 3D-PRINTING BASED FLUOROSCOPIC CORONARY ANGIOGRAPHY SIMULATOR AS A LEARNING MEDIA FOR DIAGNOSTIC CORONARY ANGIOGRAM

Mawaris, K., Gharini, P.P.R., Anggrahini, D.W.

Background : Resident of cardiology and vascular medicine should be able to perform coronary angiography (CA) with good projection, choose an informative image angles, and evaluate a normal and pathologic coronary artery. The ability to interpret spatial or diagnostic CA is a complex skill to learn. To date, there is no learning media that can simulate CA in concrete way as well as being radiation-free, portable, and cost-effective.

Objectives : To create and validate a design of learning media that can simulate CA mechanism in concrete way, as well as realistic, portable, and cost-effective prior to production and trial for student.

Methods : Using part of “Research & Development” step to create 2D design and 3D model design of learning media. Validation of anatomist and engineering expert (subject group I) used an interview guide instrument, while validation of fluoroscopic CA expert (subject grup II) used questionnaire instrument.

Results : A design of fluoroscopic CA simulator consist of transparent heart mannequin, and 3D opaque coronary mannequin made from normal patient’s CT-scan (CT-scan derived), visible light and paper screen connected in C-arm system (scaled down), and video circuits. Validator consisted of anatomist (n=1), instrumentational technician (n=1), cardiology interventionist (n=3), cardiology interventionist fellow (n=2), and interventional radiographer (n=3). The rating scores of all aspects was categorized very eligible (90%). Each aspect : relevance to curriculum (94%), educational value (92%), efficiency (88%), accuracy (90%), aesthetic (80%), durability (83%), safety (95%), storage and portability (91%), cost (97%) were also categorized as very eligible. Realism of simulation angiogram of right coronary artery (RCA) were assesed as very similar by all subject (100%) of group II, while left coronary artery (LCA) received variable assessment from quite similar to very similar.

Conclusion : This research and development resulted a design of learning media in the form of fluoroscopic CA simulator. Most of the components consist of 3D-printing-based materials. The design was validated by experts and practitioners as very eligible as a diagnostic CA learning media. The realistic level of simulated RCA angiogram was assessed as very similar (face validity), while simulated LCA angiogram was assessed as quite similar with few sugestion for improvement.

Keywords : Coronary angiography simulator, learning media validation, 3D-printing learning media, 3D-printing coronary.