Current trends in medical education: Role of rural placement

Jerzy Kuzma
Iwona Kolodziejczyk

Abstract

The purpose of this paper is to review recent trends and innovations in medical education with special interest in training in general and rural medicine by means of a thematic analysis of the recent literature.

We identify six main trends: (1) the shift from teacher- to learner-centred approaches; (2) multilevel integration between subjects (3); transition from process-based to competency-based training; (4) application of simulation technique in medical education; (5) increasing role of the utilization of online and IT technologies; and (6) the decentralization of clinical placements from main urban hospitals to longitudinal placement in peripheral urban and rural facilities with emphasis on generalist training.

We conclude that benchmarking of medical education to the world standards requires staying abreast of the new trends in medical education and the visionary leadership to implement methods that have been proved effective. In low- and middle-income countries introduction of some new approaches such as longitudinal rural placement, online learning or simulation techniques, requires substantial funds which the universities cannot afford alone without the government support. Desperate needs for doctors in Papua New Guinea rises the dilemma between satisfying the health system needs by producing more graduates at low-cost curricula and the need to meet quality global standards of medical education by implementing new and more effective approaches to teaching and learning.

Key words: medicine, medical training, rural medicine.

Trends in medical education

Shift from teacher to learner-centred approaches

In the last two decades, medical education, following all higher education, has gone through unprecedented changes with the focus shifting from teacher-centred towards interactive, learner-centered approaches (Harden & Hart, 2002). Shifting the focus towards the student-learner involves de-emphasizing the role of the

lecture and changing the role of an academic teacher from providing knowledge to encouraging, motivating, facilitating, leading discussion, and assessing achieving learning objectives and competencies. Bringing self-directed learning into the centre of attention involves the learner as an active participant and boosts the advance of deep learning (Mansur, Kayastha, Makaju & Dongol, 2012). Problem-based learning (PBL) and case-based learning (CBL) are learner-centred approaches where the teacher acts as a facilitator. These approaches utilize real life problems as a focus for learning basic science and clinical knowledge along with clinical reasoning skill (Mansur et al., 2012).

Multilevel integration between subjects

Another observed shift towards integrated learning entails movement from traditional subject-based curriculum to an integrated approach. Integrated curriculum diminishes compartmentalization of disciplines and reduces overloaded curriculum while focusing on achieving required competencies of graduating physicians (Hassan, 2013; Quintero, et al., 2016). Traditional medical education based on a succession of subjects studied in different departments has been criticized for low effectiveness in achieving a competent doctor because of unnecessary repetition and isolation between subjects (Association of American Medical Colleges, 1984). Horizontal integration crosses borders between sciences and premedical sciences while vertical integration reaches to an advanced level applying sciences in clinical problem solving (Gaddam, Gowda, & Vaidyanathan, 2015; Hassan, 2013). Thwin (2016) pointed out the role of mind maps utilization in integration between sciences and clinical application. To assure the integration, modern medical curricula move towards systems teaching with organized references to common pathology. As noted earlier, in more advanced years in training, there is an increasing involvement of problem-based learning and case-based learning. An integrated approach, rooted in clinical application, is supported by constructivism philosophy of adult pedagogy (Quintero, et al., 2016).

Transition from process-based to competency-based training

Following international trends in medical education, training in Australia is at the transition stage from process-based requirements to competency or outcomes/competency-based standards (Iobst et al., 2010; Roberts et al., 2011). Ensuring that core competencies are achieved by a medical program, graduates' competencies have become an overarching component in constructing modern medical curricula (Olopade, Adaramoye, Raji, Fasola, & Olapade-Olaopa, 2016; Ross, Hauer, & van Melle, 2018). Dath and Iobst (2010) underlined the pivotal role of front-line teachers in the effective implementation of adult learning pedagogy and competency based strategy. Apart from clinical competencies, students are required to advance generic competencies essential to their future roles in the health system (Shah, Desai, Jorwekar, Badyal, & Singh, 2016; ten Cate, 2017). These include bio-ethics and communication skills, interpersonal skills, skills to build doctor-patient relationship, working in a team, decision-

making capability, management and organization skills, and IT skills (Majumder, D'Souza & Rahman, 2004).

Application of simulation techniques

One of the current trends in medical education is utilization of simulation techniques which is becoming an essential component of most medical programs (Ker & Bradley, 2010; see Figure 1). Among factors contributing to the proliferation of simulation techniques are listed such as shortening training time, conducting training at a suitable time, team-based learning and assuring patients' safety (see Figure 1).

Figure 1. Drivers for the development of simulation
Source: Ker & Bradley (2010, Figure 12.2)

There is a growing body of evidence that clinical skills attained in medical simulation settings transfer directly to better patient care and improves patient outcomes. Medical simulation engages learners in an exceptional clinical education experience in a safe, realistic and effective environment. In the simulated environment, learners can practice in a risk free and realistic environment that enables students to build self-confidence through skills mastery (Al-Elq, 2010; Weller, Nestel, Marshall, Brooks, Conn, 2012). Evidence is building that simulation based medical education with deliberate practice is equally effective and sometimes even more effective than the traditional Halsted's approach "see one, assist one, do one" in effective skills acquisition which are transferable to the clinical situation (Domuracki, Moule, Owen, Kostandoff & Plummer, 2009). A meta-analysis of 14 randomized control trials demonstrated that that simulation-based medical education with deliberate

practice is more effective than the traditional approach to clinical education towards competency acquisition ($p<0.001$, effect size 0.7) (McGaghie, Issenberg, Cohen, Barsuk & Wayne, 2011).

Factors contributing to achieving better results in simulation based medical education are: reduced undesired interference and stress level; chance to tailor training to individuals; and opportunity to practice repeatedly until competency is achieved which is especially important for slower learners (Bradley, 2006). Additional benefits of simulation techniques are avoidance of risk to patients and learners and the enhancement of skills and knowledge transfer to the real situation (Bradley, 2006; Weller, et al., 2012). Simulation based medical education has been introduced successfully to the clinical assessment armamentarium, for example, in trauma management and resuscitation (Chan, et al., 2018; McGahie, Issenberg, Petrusa & Scalese, 2010) and in critical care medicine (Beal, et al., 2017). It has been long practiced in Advanced Trauma Life Support and Resuscitation workshops aimed at achieving and assessing desirable competencies. However, effective use of simulation technology is a complex, multi-stage process that requires adequate training of instructors and attention to priorities followed at a local clinical setting (McGahie et al., 2010). McGaghie et al. (2011) further argue that for simulation technique with deliberate practice to be effective, it has to fulfil the following conditions: highly motivated learners; defined learning objectives and tasks; appropriate level of difficulties; focused, repetitive practice; rigorous measurement tools; informative feedback with error corrections; performance evaluation; and advancement to the next task. There is no doubt that simulation technology can produce substantial educational benefits.

Increasing role of online and IT technologies in medical education

Advancements in IT technologies encouraged medical education to turn increasingly to web-based instruction, e-learning and virtual education (Ward, Gordon, Field & Lehmann, 2001). Easy access to internet and computers and increased computer literacy places more demand on utilizing technology-based learning at a time convenient to the learner (Harden & Hart, 2002). Flipped learning is gaining an increased popularity in higher education. It is blended mode of learning where the students are given theoretical material online to study and perform task individually while the face-to-face group teaching time is utilized on interaction with experts which is required for development of higher cognitive skills among students (Greener, 2016; Figure 2). Wood (2016) demonstrated that a flipped mode of delivery was well perceived by students and two thirds will recommend it to be used in other units.

For instance, in pharmacology subjects, students appreciated blended mode and recommended extension to other subjects provided the program is well-structured, materials of a high quality and a sufficient number of interactive tutorials is offered (Morton et al., 2016). It is acknowledged that medicine is a practice-based discipline and therefore complete replacement of traditional teaching by online teaching is not possible.

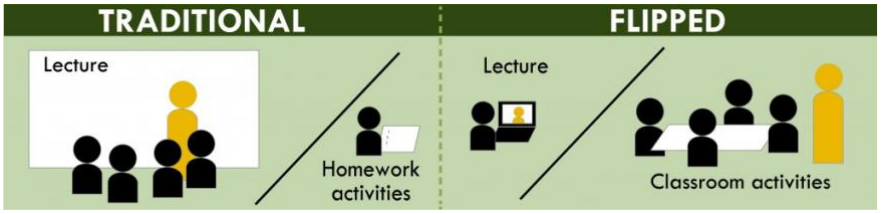

Figure 2. Traditional vs. flipped classroom models.
Source: Kalikoff (2015) as cited in Monem (2016).

However, increasingly there is discussion how internet learning can complement traditional teaching in medicine. Other studies advocate that blended learning could be utilized to teach subjects that traditionally occupied only a small amount of time within the curriculum, such as dermatology, radiology, and ear, nose and throat surgery (Mahnken, Baumann, Meister, Schmitt & Fischer, 2011; Silva, Souza, Silva Filho, Medeiros, Criado, 2011; Grasl et al., 2012).

Decentralization of clinical training with shift to longitudinal generalized practice in rural environment

Another contemporary movement in undergraduate medical education is decentralization of clinical training by moving it from training in large specialized hospitals towards supervised general practice. There is a growing body of literature that assesses decentralized clinical training predominantly from Australia, North America, Canada and, more recently, South Africa. Although rural placement and longitudinal generalist practice showed comparable and sometimes superior results to traditional training through short specialist blocks, it is facing longstanding stereotypes regarding training outside large urban hospitals viewed as waste of time and far away from "real medicine" in big hospital centers centres (Tesson, Curran, Pong & Strasser, 2005). Clinical clerkship in traditional medical curricula places the accent on relatively short block rotations and frequent changes in disciplines. A new model proposing the longitudinal integrated clerkship (LIC) is one model that is gathering sizable support internationally and being increasingly implemented in rural and urban settings (Hirsh, Ogur, Thibault & Cox, 2007; Krupat et al., 2009). Another study recorded that positive outcomes of LIC include comparable or sometimes better academic results, more advanced patient-centered communication skills, higher-order of cognitive and clinical skills, and more willingness to embrace increased responsibility with patients than among students placed on short block rotations in large central hospitals. Additionally, longitudinal exposure of the medical students to rural blocks influences them to pursue generalist carrier in rural environment (Halaas, Zink, Finstad, Bolin & Center, 2008).

However, placing students at decentralized sites is a complex logistic task, which requires effort and resources on the site of the medical school and the training site (Wilson et al., 2009). Moving a part of clinical training away from the institutional core academic hospital requires visionary leaders at the medical

school to upscale the decentralized training (Sen Gupta & Murray, 2006). The same authors further argue that an optimal assessment in decentralized training should be based on outcome-competency assessment and be kept simple.

In recent years, a number of medical schools redirected their clinical educations programs to provide students with an opportunity to practice in rural environments. In 2000, Australia was one of the first countries that implemented a national policy offering longer rural programs to undergraduate medical students. This policy is one of many tactics aiming to increase number of rural doctors (O'Sullivan, McGrail, Russell, Chambers & Major, 2018). Between 2009 and 2015 the number of general practice training places in Australia have doubled, and that placed demand on the recruitment of more GP supervisors (Dath et al., 2010). For instance, at Flinders Medical School students spent the whole of the third-year in rural community settings (Worley, Silagy, Prideaux, Newble & Jones, 2000). Several studies have demonstrated that when the rural-exposed cohort of students was compared to the corresponding urban students group with training based on acute care in centralized hospitals, the rural group showed a comparable or higher level of performance on common exams (Worley, Esterman & Prideaux 2004; Glasser, Hunsaker, Sweet, MacDowell & Meurer, 2008). The literature suggests that students trained at smaller rural and remote sites are not academically disadvantaged and students perceived their learning experience as more meaningful that that they would expect from training in the urban specialized hospitals. (Birden & Wilson, 2012; Van Schalkwyk, Kok, Conradie & Van Heerden, 2015). Furthermore, the students at generalist practice have exposure to an undifferentiated wider range of patients than at highly specialized units (Wilson et al., 2009).

These rural placement initiatives aim to produce more candidates willing to undertake practice in rural and remote areas. These eventually may lead to a long-term solution for recruitment and retaining doctors in rural facilities (Tesson et al., 2005). It has been shown that a greater exposure of students to practice in rural environment during their medical education increases the chances of rural practice as a professional career path (Shelker, Zaharic, Sijnja & Glue, 2014; Farmer, Kenny, McKinstry & Huysmans, 2015; de Villiers et al., 2017; Wenghofer, Hogenbirk & Timony, 2017).

Rural blocks offer opportunities for community outreach medical education providing students with better understanding of public health and preventive medicine. Along with adopting a decentralized model of clinical training, some universities also offer curriculum that places a strong emphasis on primary health care including rural and remote health issues (Amalba, van Mook, Mogre & Scherpbier, 2016; Hays, 2007; Tesson et al., 2005). The medical curricula should take into consideration the health needs of the community concerned encompassing health promotion and illness prevention, assessment and targeting of population needs, and awareness of environmental and social factors in disease.

Conclusion

We conclude that benchmarking of medical education to the world standards requires staying abreast of the new trends in medical education and the visionary leadership to implement methods that have been proved effective. In low- and middle-income countries, introduction of some new approaches such as longitudinal rural placement, online learning or simulation techniques, requires substantial funds which the universities cannot afford alone without the government support. Desperate needs for doctors in Papua New Guinea rises the dilemma between satisfying the health system needs by producing more graduates at low-cost curricula and the need to meet quality global standards of medical education by implementing new and more effective approaches to teaching and learning.

References

Al-Elq, A.H. (2010). Simulation-based medical teaching and learning. *Journal of Family & Community Medicine, 17*(1), 35-40. doi: 10.4103/1319-1683.68787

Amalba, A., van Mook, W. N. K. A., Mogre, V., & Scherpbier, A. J. J. A. (2016). The effect of Community Based Education and Service (COBES) on medical graduates' choice of specialty and willingness to work in rural communities in Ghana. *BMC Medical Education, 16*(79). https://doi.org/10.1186/s12909-016-0602-8

Association of American Medical Colleges. (1984). Physicians for the 21st century: The GPEP Report: Report of the Panel on the General Professional Education of the Physician and College Preparation for Medicine. *Journal of Medical Education, 59*, 201-208.

Beal, M., Kinnear, J., Anderson, C.R., Martin, T.D., Wamboldt, R., & Hooper, L. (2017). *The effectiveness of medical stimulation in teaching medical students critical care medicine: A systematic review and meta-analysis*. Retrieved from: https://core.ac.uk/download/pdf/77284070.pdf

Birden, H. H., & Wilson, I. (2012). Rural placements are effective for teaching medicine in Australia: Evaluation of a cohort of students studying in rural placements. *Rural Remote Health, 12*(2167).

Bradley, P. (2006). The history of simulation in medical education and possible future directions. *Medical Education, 40*(3), 254–262. https://doi.org/10.1111/j.1365-2929.2006.02394.x

ten Cate, O. (2017). Competency-based postgraduate medical education: Past, present and future. *Journal for Medical Education, 34*(5). doi: 10.3205/zma001146.

Chan, P.G., Schaheen, L.W., Chan, E.G., Cook, C., Luketich, J.D., & D'Cunha, J. (2018). Technology-enhanced simulation improves trainee readiness transitioning to cardiothoracic training. *Journal of Surgical Education, 75*(5), 1395-1402.

Dath, D., & Iobst, W. (2010). The importance of faculty development in the transition to competency-based medical education. *Medical Teacher, 32*(8), 683–686.

de Villiers, M., van Schalkwyk, S., Blitz, J., Couper, I., Moodley, K., Talib, Z., & Young, T. (2017). Decentralised training for medical students: A scoping review. *BMC Medical Education, 17*(196). https://doi.org/10.1186/s12909-017-1050-9

Domuracki, K. J., Moule, C. J., Owen, H., Kostandoff, G., & Plummer, J. L. (2009). Learning on a simulator does transfer to clinical practice. *Resuscitation, 80*(3), 346-349.

Farmer, J., Kenny, A., McKinstry, C., & Huysmans, R. D. (2015). A scoping review of the association between rural medical education and rural practice location. *Human Resources for Health, 13*(27). https://doi.org/10.1186/s12960-015-0017-3

Gaddam, V.L., Gowda, V., & Vaidyanathan, K. (2015). Comparison of the effectiveness of horizontal integration with traditional teaching approach in first-year MBBS students. *Journal of Medical Science and Public Health, 5*(7), 1360-1363.

Glasser, M., Hunsaker, M., Sweet, K., MacDowell, M. & Meurer, M. (2008). A comprehensive medical education program response to rural primary care needs. *Academic Medicine, 83*(10), 952–961. https://doi.org/10.1097/ACM.0b013e3181850a02.

Grasl, M. C., Pokieser, P., Gleiss, A., Brandstaetter, J., Sigmund, T., Erovic, B. M., & Fischer, M. R. (2012). A new blended learning concept for medical students in otolaryngology. *Archives of Otolaryngology – Head & Neck Surgery, 138*(4), 358–366. https://doi.org/10.1001/archoto.2012.145 .

Greener, S. (2016). What is special about flipped learning? Some reflections on a current pedagogic design. In G. Whisker, L. Marshall, S. Greener, & J. Canning (Eds.), *Flexible futures: Articles from the Learning and Teaching Conference 2014* (pp. 8-17). University of Brighton. Retrieved from: https://staff.brighton.ac.uk/clt/published/Flex_Futures_for_web.pdf

Halaas, G. W., Zink, T., Finstad, D., Bolin, K., & Center, B. (2008). Recruitment and retention of rural physicians: Outcomes from the rural physician associate program of Minnesota. *Journal of Rural Health, 24*, 345–352.

Harden, R. M., & Hart, I. R. (2002). An international virtual medical school (ivimeds): The future for medical education? *Medical Teacher, 24*(3), 261–267. https://doi.org/10.1080/01421590220141008.

Hassan, A. (2013). Concepts of vertical and horizontal integration as an approach to integrated curriculum. *Education in Medicine Journal, 5*(4), e1–e5. http://eduimed.usm.my/EIMJ20130504/EIMJ20130504_01.pdf.

Hays, R. B. (2007). Rural medical education in Europe: The relevance of the Australian experience. *Rural and Remote Health, 7*(1), 683 (Online). Retrieved from https://www.rrh.org.au/journal/article/683

Hirsh, D. A., Ogur, B., Thibault, G. E., & Cox, M. (2007). New models of clinical clerkships: "Continuity" as an organizing principle for clinical education reform. The *New England Journal of Medicine*, *356*, 858–866.

Iobst, W. F., Sherbino. J., Cate, O. T., Richardson, D.L., Dath, D., Swing, S.R., ... Frank, J.R. (2010). Competency-based medical education in postgraduate medical education. *Medical Teacher, 32*(8), 651–656. https://doi.org/10.3109/0142159X.2010.500709.

Kalikoff, B. (2015). *Flipping the classroom*. Seattle, WA: University of Washington, Center for Teaching and Learning. Retrieved from https://www.washington.edu/teaching/teaching-resources/engaging-students-in-learning/flipping-the-classroom/.

Ker, J. & Bradley, P. (2010). Simulation in medical education. In T. Swanwick (Ed.), *Understanding medical education: evidence, theory and practice* (pp. 164-180). Oxford: Association for the Study of Medical Education.

Krupat, E., Pelletier, S., Alexander, E. K., Hirsh, D., Ogur, B., & Schwartzstein, R. (2009). Can changes in the principal clinical year prevent the erosion of students' patient-centered beliefs? *Academic Medicine*, *84*(5), 582–586. https://doi.org/10.1097/ACM.0b013e31819fa92d.

Mahnken, A. H., Baumann, M., Meister, M., Schmitt, V., & Fischer, M. R. (2011). Blended learning in radiology: Is self-determined learning really more effective? *European Journal of Radiology*, *78*(3), 384–387. https://doi.org/10.1016/j.ejrad.2010.12.059.

Majumder, A. A., D'Souza, U., & Rahman, S. (2004). Trends in medical education: challenges and directions for need-based reforms of medical training in South-East Asia. *Indian Journal of Medical Sciences*, *58*(9), 369-380.

Mansur, D. I., Kayastha, S. R., Makaju, R., & Dongol, M. (2012). Problem based learning in medical education. *Kathmandu University Medical Journal*, *10*(4), 78-82. https://doi.org/10.3126/kumj.v10i4.11002

McGaghie, W. C., Issenberg, S. B., Cohen, E. R., Barsuk, J. H., & Wayne, D. B. (2011). Does simulation-based medical education with deliberate practice yield better results than traditional clinical education? A meta-analytic comparative review of the evidence. *Academic Medicine*, *86*(6), 706–711. https://doi.org/10.1097/ACM.0b013e318217e119.

McGahie, W. C., Issenberg, S. B., Petrusa, E. R., & Scalese, R. J. (2010). A critical review of simulation-based medical education research: 2003-2009. *Medical Education*, *44*(1), 50-63. https://doi.org/10.1111/j.1365-2923.2009.03547.x.

Monem, J. (2016). *Flipping classroom for a more engaged class.* Mahwah, NJ: Ramapo College, Faculty Resource Center. Retrieved from https://www.ramapo.edu/frc/files/2015/10/Flipped-Classrooms-022416-Handout.pdf

Morton, C. E., Saleh, S. N., Smith, S. F., Hemani, A., Ameen, A., Bennie, T. D., & Toro-Troconis, M. (2016). Blended learning: How can we optimise

undergraduate student engagement? *BMC Medical Education, 16*(195). https://doi.org/10.1186/s12909-016-0716-z.

Olopade, F., Adaramoye, E., Raji, Y., FAsola, A.O., & Olapade-Olaopa, E.O. (2016). Developing a competency-based medical education curriculum for the core basic medical sciences in an African Medical School. *Advances in Medical Education and Practice, 7,* 389-398. doi: https://doi.org/10.2147/AMEP.S100660.

O'Sullivan, B. G., McGrail, M. R., Russell, D., Chambers, H., & Major, L. (2018). A review of characteristics and outcomes of Australia's undergraduate medical education rural immersion programs. *Human Resources for Health*, *16*, 8. https://doi.org/10.1186/s12960-018-0271-2.

Playford, D. E., Nicholson, A., Riley, G. J., & Puddey, I. B. (2015). Longitudinal rural clerkships: Increased likelihood of more remote rural medical practice following graduation. *BMC Medical Education, 15*(55). doi: 10.1186/s12909-015-0332-3.

Quintero, G.A., Vergel, J., Arrendondo, M., Ariza, M-C., Gomez, P., & Pinzon-Barrios, A-M. (2016). Integrated medical curriculum: Advantages and disadvantages. *Journal of Medical Education and Curricular Development, 3,* 133-137. doi:10.4137/JMECD.S18920.

Roberts, R. G., Hunt, V. R., Kulie, T. I., Schmidt, W., Schirmer, J.M., Villanueva, T., & Wilson, C. R. (2011). Family medicine training – the international experience. The *Medical Journal of Australia*, *194*(11 Suppl), S84-S87. https://doi.org/10.5694/j.1326-5377.2011.tb03135.x.

Ross, S., Hauer, K.E., & van Melle, E. (2018). Outcomes are what matter: Competency-based medical education gets us to our goal. *MedEdPublish, 7*(2). doi: https://doi.org/10.15694/mep.2018.0000085.1

Sen Gupta, T., & Murray, R. B. (2006). Rural internship for final-year medical students. The *Medical Journal of Australia*, *185*(1), 54–55. https://doi.org/10.5694/j.1326-5377.2006.tb00462.x.

Shah, N., Desai, C., Jorwekar, G., Badyal, D., & Singh, T. (2016). Competency-based medical education: An overview and application in pharmacology. *Indian Journal of Pharmacology, 48*(Suppl 1), S5-S9. doi: 10.4103/0253-7613.193312.

Shelker, W., Zaharic, T., Sijnja, B., & Glue, P. (2014). Influence of rural background and rural medical training on postgraduate medical training and location in New Zealand. *New Zealand Medical Journal*, *127*, 12–16.

Silva, C. S., Souza, M. B., Silva Filho, R. S., Medeiros, L. M., & Criado, P. R. (2011). E-learning program for medical students in dermatology. *Clinics*, *66*(4), 619–622. https://doi.org/10.1590/S1807-59322011000400016.

Strasser, R. (2001). Training for rural practice: Lessons from Australia. *Canadian Family Physician*, *47*, 2196–2198, 2203–2205.

Tesson, G., Curran, V., Pong, R., & Strasser, R. (2005). Advances in rural medical education in three countries: Canada, the United States and

Australia. *Education for Health, 18*(3), 405–415. https://doi.org/10.1080/13576280500289728.

Thwin, E. (2016, February). *Mind maps: Bridging basic science and clinical reasoning skills*. Paper presented at the Innovations in Medical Education: Transforming Health Professions Education through Innovation Conference, February 19-20, University of Southern California. Retrieved from: https://cpb-us-e1.wpmucdn.com/sites.usc.edu/dist/3/169/files/2018/05/IME-2016-Conference-Proceedings-1tzjmfz.pdf

van Schalkwyk, S., Kok, N., Conradie, H., & van Heerden, B. (2015). Academic achievement of final-year medical students on a rural clinical platform: Can we dispel the myths? *African Journal of Health Professions Education, 7*(1), 115–118.

Ward, J. P., Gordon, J., Field, M. J., & Lehmann, H. P. (2001). Communication and information technology in medical education. *The Lan*cet, 357(9258), 792–796. https://doi.org/10.1016/S0140-6736(00)04173-8.

Weller, J.M., Nestel, D., Marshall, S.D., Brooks, P.M., & Conn, J.J. (2012). Similation in clinical teaching and learning. *The Medical Journal of Australia, 196*(9). doi: 10.5694/mja10.11474.

Wenghofer, E. F., Hogenbirk, J. C., & Timony, P. E. (2017). Impact of the rural pipeline in medical education: Practice locations of recently graduated family physicians in Ontario. *Human Resources for Health*, *15*(16). https://doi.org/10.1186/s12960-017-0191-6.

Wilson, N., Couper, I., De Vries, E., Reid, S., Fish, T., & Marais, B. (2009). A critical review of interventions to redress the inequitable distribution of healthcare professionals to rural and remote areas. *Rural Remote Health*, *9*, 1060. Retrieved from https://www.rrh.org.au/journal/article/1060.

Wood, H. (2016). Experiences and reflections of flipping the classroom. In G. Whisker, L. Marshall, S. Greener, & J. Canning (Eds.), *Flexible futures: Articles from the Learning and Teaching Conference 2014* (pp. 18-26). University of Brighton. Retrieved from: https://staff.brighton.ac.uk/clt/published/Flex_Futures_for_web.pdf

Worley, P., Esterman, A., & Prideaux, D. (2004). Cohort study of examination performance of undergraduate medical students learning in community settings. *British Medical Journal, 328*(7433), 207–209. https://doi.org/10.1136/bmj.328.7433.207.

Worley, P., Silagy, C., Prideaux, D., Newble, D., & Jones, A. (2000). The parallel rural community curriculum: An integrated clinical curriculum based in rural general practice. *Medical Education, 34*(7), 503–504. https://doi.org/10.1046/j.1365-2923.2000.00668.x.

Jerzy Kuzma
A missionary, religious brother of the Society of Divine Word (SVD) working in PNG since 1997. Currently, an honorary consultant general and orthopedic surgeon at Modilon General Hospital. He has initiated and completed seven

developmental grants projects for the Modilon General Hospital developing the orthopedic unit and providing orthopedic services to the Momase Region.

Professor of Surgery at the Faculty of Medicine and Health Sciences at DWU and HOD of the Department of Medicine, he is currently administrating and developing a new medical program (MBBS) at DWU. An active researcher with numerous local and international peer reviewed journal publications, many presentations on medical and surgical symposia; has a wide research scope including clinical, social and public health studies. Author of a surgical book for primary health workers (2 editions).

Iwona Kolodziejczyk
Associate Professor and Director of Centre for Learning and Teaching at Divine Word University. Her research interests are in gender and technology, technology in higher education and intervention for social change. She specializes in mixed methods and participatory action research. She has published in local and international journals as well as presented her research findings at international conferences.