International Surgery Journal
Jain AKC. Int Surg J. 2018 Nov;5(11):3789-3794
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

Review Article

DOI: http://dx.doi.org/10.18203/2349-2902.isj20184668

Amit Jain's new models for diabetic foot

Amit Kumar C. Jain*

Consultant and Head, Amit Jain's Institute of Diabetic Foot and Wound Care, Brindhavvan Areion Hospital, Bangalore, India

Received: 27 September 2018
Accepted: 02 October 2018

***Correspondence:**
Dr. Amit Kumar C. Jain,
E-mail: dramitkumarcj@yahoo.in

ABSTRACT

Diabetes mellitus and its complications are growing worldwide. Diabetic foot is one such devastating complication often associated with amputation and mortality if not prevented. Various different specialists are involved in management of diabetic foot in form of multidisciplinary approach in view of lack of diabetic foot surgeons. The author proposes various new models for diabetic foot that are novel, visionary, practical and applicable in Asian countries like India where the education pattern is different from the west. These new concepts are addition to author's Amit Jain's system of practice for diabetic foot, which now is considered a modern diabetic foot surgery.

Keywords: Amit Jain, Diabetic foot, India, Models, Surgery, Team

INTRODUCTION

Diabetes mellitus is a non-communicable, chronic, serious, complex and debilitating disease that affects every part of the body.[1,2,3] It has approximately affected 415 million people worldwide.[3] Diabetic foot is one of the most common complications of diabetes that can lead to amputation.[1,2,3] It is estimated that 15% of the diabetic patients will develop ulcers during their lifetime.[2] The diabetic foot complications are costly complication in today's scenario.[4]

MULTIDISCIPLINARY TEAM APPROACH

There is enough western literature which suggests for a multidisciplinary /interdisciplinary approach for diabetic foot .[1,4,5,6,7] The members in the team recommended range from endocrinologist, infectious disease specialist, podiatrist, orthopedic surgeon, microbiologist, reconstructive surgeon, physical therapist, pedorthotist, orthotists, nurse, dietician, microbiologist, psychiatrist, nurse educator, vascular surgeon, general surgeon, neurosurgeon, general surgeon.[5,8,9,10,11] Numerous centers in the western literature have reported significant reduction in amputation.[5]

CURRENT DIABETIC FOOT MODELS

Various models are employed to form a limb salvage team. The 3 well known models from west are the Endocrinology- Podiatry model, the Plastic Surgeon-Podiatry model and the Vascular Surgeon- Podiatry model.[10] These entire models have subspecialty podiatry associated with it. These models are found to be good and effective in the respective countries.

NEED FOR NEW MODELS FOR DIABETIC FOOT

Various Asian countries like India have different education pattern and also the disease pattern. Further the involvement of too many specialists in every patient is likely to add the burden to the patient financially. The author is of opinion that there are too many cooks in the multidisciplinary team and some of the specialist like neurosurgeon actually does not have any role in diabetic foot management and yet it's claimed that they are

important member of the team.[11] In one of the study done by Jain et al, it was seen that many specialist like vascular surgeon, plastic surgeon, infectious disease specialist either have restricted role based on need of the situation or no role at all in limb salvage in tertiary care centre when specialist diabetic foot surgeon is present.[12]

Some suggest podiatrist are gate keeper, some suggest plastic surgeon whereas other states physician to be the gate keeper in diabetic foot.[9,13] It is known that the podiatry is a well-recognized specialty in western world with significant period of training and after completion of these courses directly, they are awarded degrees like DPM. They don't have to do MBBS and they can treat diabetic foot.

In countries like India, this is not acceptable by the system. There is no direct training like DPM. The basic medical qualification to practice any form of medicine is MBBS (Bachelor of Medicine and Surgery) in Allopathy or equivalent in alternative medicine like BAMS in Ayurveda, BHMS in Homeopathy, etc. This qualification entitles doctors to treat basic/routine diseases. A post graduate qualification like Surgery or Orthopedics is required to do surgeries on foot.

Almost all the general surgeon's treats diabetic foot during their training as part of the recommended curriculum. Orthopedic counterpart treats trauma or congenital deformities of foot in their training and diabetic foot is often not treated by them as such.

The doctors who want to become a specialist in diabetic foot surgery/podiatric surgery will have to undergo further postdoctoral clinical training in form of either fellowships/diplomas which are available in different parts of the India over past one decade. The Indian medical council doesn't have a Mch program for organ specific specialty like Hand, Diabetic foot, Breast, etc. In other countries, the surgeons can undergo postdoctoral training or certification in diabetic foot as applicable for them to be called as diabetic foot surgeons in case postdoctoral fellowship are not available.

In Simple words the minimum qualification required to do various surgical procedures including amputation in diabetic foot is a MS/DNB in general surgery/ orthopedics to avoid any legal issues as per medical council. Subsequent training on diabetic foot can be done by them at specialized diabetic foot center's to enhance their skills and specialty. The advantage of a postgraduate general surgeon and a general physician is the ability to treat wide variety of disease and patient on a whole in view of them being generalist as per council regulation and over all general trends of them being considered as all-rounders / Jack of all. An orthopedician however does not enjoy this liberty.

An MBBS person who shows interest and undergoes training to treat diabetic foot/ podiatry still requires having a surgeon as a backup to deal with amputation and different advanced procedure. Further in today's era in country like India, they are often not employed as consultants in hospitals and neither are they permitted to head a Division or Department which is unfortunate for many of the youngsters who are passionate and want to treat diabetic foot after their basic qualification but are not able to do so due to regulations. The author himself was interested to treat diabetic foot and wounds after MBBS more than a decade ago but knowing the rules completed his desire by doing a post-graduation in surgery and then post-doctoral fellowship in diabetic foot from a reputed diabetic limb salvage centre in India.[14]

Similarly, GNM/ BSC are the basic qualification needed for nurses. They can do dressings and treat wounds in general. For them to become specialist wound care nurses they have to undergo certified courses. Shockingly, even today, it's not a chosen specialty by nurse in India whereas it's in high demand in west and Middle East countries.

There are courses for paramedics for 1 to 2 years in some centers in India in diabetic foot.[14] They are technically podiatry assistant or wound care assistants and not podiatrist like the western counterpart. They are a good help in diabetic foot setup but are always under supervision of the treating doctors.

Often some online training in diabetic foot is being offered for various nurses, doctor and non-healthcare professionals to become a podiatrist. These aren't accepted by many hospitals and institute due to legal issues. Such short online trained members and podiatry assistant also do not form team members like that of western counterpart podiatrist models.

The author has observed that no one has yet said in the literature that a clinically trained and certified postdoctoral diabetic foot surgeon to be the gate keeper or the head of the diabetic foot division or department.

CURRENT MODEL OF DIABETIC FOOT TEAM IN INDIA

One of the successful and reputed team models on diabetic foot is the Endocrinology- Podiatry model at Amrita Institute.[14] This is however little distinct, and advance compared to western counterpart of endocrinology – podiatry model due to the fact that the podiatry is at super-subspecialty level and are postdoctoral in nature from where the author was trained.

The author has observed that there are many other successful center's in India which also tries to function on the successful "toe- flow" model of west which is the podiatry- vascular model.[9] However in these models, the podiatry counterpart is a nurse, or a podiatry assistant or an MBBS doctor who actually don't work like the podiatry counterpart of toe and flow model. They are kept

for doing bedside ABI and VPT or dressing and the entire thing is done under vascular surgeon. Many of them are not even allowed to operate in Operation Theater on foot. These however are not standard model of the west.

Many hospitals and medical colleges run foresaid diabetic foot clinic. The members vary in these clinics ranging from junior most faculty, to interns, postgraduates, SHO, etc. but are under supervision of a senior. Though entitled to function and obtain good results in term of limb salvage, these aren't the models for diabetic foot specialty.

Similarly, many run preventive models in clinic that is owned by general practitioner, general physician, etc. who take basic training in diabetic foot and are interested to handle foot of diabetes themselves. These are preventive foot care and are good initiative especially at districts and other rural setups. But yet again they aren't the model of care for diabetic foot specialty as such.

THE NEW AMIT JAIN'S MODEL FOR DIABETIC FOOT

As stated earlier, the education pattern of doctors is different in Asian countries like India. It is also known that diabetic foot disease pattern is different in India in comparison to west. For example, the prevalence of peripheral arterial disease in diabetics was found to be 4% to 15%.[15]

Various studies also show that majority of cases admitted in hospital are type 1 diabetic foot complications which are infective ranging from 85 to 91%.[16,17]

It's time to have some new models suitable for countries like India and those countries whose education system is similar to India. The following are the models proposed by the author who has worked through these models. Until and unless mentioned, the surgeon mentioned in these standard models is a clinically trained postdoctoral diabetic foot surgeon. All these models do have the routine nurse/ wound care assistant with the diabetic foot surgeon who are his important paramedic team mates.

A) Amit Jain's team model 1 for diabetic foot (the general surgeon- diabetic foot surgeon model)

Hypothetically and practically, this is a good model in developing and underdeveloped countries wherein general surgery department is consulted for diabetic foot problems especially in medical college hospitals. In most of the South Asian countries like India, diabetic foot problems are often treated by general surgery department unlike west. In this model, one of the general surgeons with core interest in diabetic foot has to undergo further extensive clinical training in diabetic foot in form of postdoctoral certification/ fellowship in diabetic foot surgery/ podiatric surgery of one to two years duration. He can subsequently return to the parent department and take care of the routine and complex diabetic foot problems. He can also enhance his field of interest by running a specialty clinic or a division of diabetic foot in conjunction with department of surgery.

The colleague surgeons can refer their complex or difficult diabetic foot cases to the diabetic foot surgeon colleague in the same department. In a study by Jain et al, it was seen that presence of a postdoctoral diabetic foot/podiatric surgery specialist can significantly decrease the role of different specialist dramatically.[12] In this study, it was seen that vascular surgeon and interventional endovascular specialist were involved in only 2.09% of the cases each, the plastic surgeon were involved in 3 cases over 3 years with 1.39% of the patients undergoing local flaps and no patient had free flap's. There was no surgery performed by the orthopedician. Further, there was no role of infectious disease specialist as most general surgeons in India are qualified, knowledge and authorized to treat their patients with antibiotics unlike west where the podiatrist may not have license or authority to use antibiotics. In this study the salvage rate was 87% which was comparable to the literature.[12] Most of the concerned specialist was consulted and involved only when complex reconstructive work was required on diabetic foot. The author had presented this study and model in Gulf diabetic foot conference GDFC 2017, held in Middle East.

A specific advantage of this model is that the diabetic foot surgeon who wants to retain his general surgical skills can continue to maintain unlike the endocrinology podiatry model wherein such skills may not be retained by the treating surgeon. Further advantage was that the patients are continued to be managed in surgical department of the college hospital.

The author did attempt to work in this model over years but could not sustain it on long. The biggest problem being the surgical ego. One will find in this model that multiple different surgical colleagues may not refer the complex diabetic foot problems to the team diabetic foot surgeon within the same department. Rather they will prefer to refer to other department like orthopedician, plastic surgeon or vascular surgeon for diabetic foot problems which they cannot handle in spite of the fact that the fellow diabetic foot surgeon who is trained can effectively managed.

Further, the surgical unit's may prefer their junior's, postgraduate's or interns to operate on diabetic foot and do dressings but wouldn't prefer to refer to the trained diabetic foot surgeon. Also, the management of the hospital also is not keen on diabetic foot specialty but prefer Oncology, Neurosurgery, Gastroenterology etc wherein they can obtain postgraduate programs from university. Another issue was the menace of floating intern and postgraduate who are not interested in treating diabetic foot but they feel as forced to do it. They don't

follow recommended protocols and dealing with this floating doctor's often is difficult.

Lack of dedicated nurse for wounds to help out diabetic foot surgeon is another drawback. Further bossing over on the nurse/ wound care assistant by the intern or the postgraduate or another surgical colleague often doesn't allow these assistants to retain long with diabetic foot surgeon. Also lack of support, gadgets and basic instruments needed in diabetic foot and vision of department/ institution head plays a crucial role in existence of such model. In such scenario, the General surgeon- Diabetic foot surgeon model is often associated with failures. The author worked for significant years in surgical department of medical college hospital to establish the general surgeon- diabetic foot surgeon model concept but couldn't sustain to obtain a specialized diabetic foot division/unit/Clinic due to above issues and many more different issues.

B) Amit Jain's model 2 for diabetic foot (the diabetologist- diabetic foot surgeon model)

This model appears to be similar to endocrinology-podiatry model of west but there some differences. In this model, the treating physician is a focused trained diabetologist [not an endocrinologist] who treats only diabetic patients. The foot complications are treated by the diabetic foot surgeon. The benefit of this model is harmony among the physician and surgeon.

This model is also effective in preventive aspect of diabetic foot as most patients with diabetes can be picked up at early stages of foot lesions and treated accordingly by the surgeon. Such model is effective in diabetes focused polyclinics/ hospital. Most of these diabetologist knows the value and importance of focused diabetic foot surgeon to render this model effective. The author also work's currently at a reputed centre based on this model.

This model however can find difficulties in tertiary care especially in medical college hospital and large multispecialty hospital where there are other physician and surgeon who also treat diabetes and diabetic foot.

Many centres try to function on this model concept but the diabetic foot surgeon counterpart is missing. The center fill's the 'diabetic foot surgeon' counterpart by a podiatry assistant or a nurse or a paramedical or an orthopedician or vascular surgeon and tries to run this model. Although they maintain good volume of patients and practice, such model cannot and should not be considered a standard Diabetologist – Diabetic foot surgeon model.

C) Amit Jain's model 3 for diabetic foot (the diabetic foot surgeon only model)

This model can be considered as an individual/one man/monodisciplinary/solo specialist model heading the department/division or the institute wherein the diabetic foot patients is entirely managed by the diabetic foot surgeon during their patient's diabetic foot problems being it acute or chronic.

The specialist diabetic foot surgeon in this model of care has a basic medical degree [MBBS] followed by a surgical postgraduate degree [MS/DNB/equivalent] followed by postdoctoral fellowship/certified clinical training in diabetic foot surgery/podiatric surgery or equivalent training program in other countries after their surgical degree. He can also retain, maintain and upgrades his knowledge on diabetes management in view of his most patients being diabetic's. As such most general surgeon in India are known to manage their surgical patients with all variety of antibiotics and many of them also manages routine diabetes patient in their ward and calls specialist in as and when needed cases.

Hence, they are able to retain their basic medical skills too as general surgeon. This is not possible if they stream line to different super-specialty like vascular surgery, plastic surgery, etc until and unless one shows extensive interest to maintain and sustain his diabetes management skills and this is purely individual based.

The Amit Jain's diabetic foot surgeon only model is undisputedly and undeniably the best model in the diabetic foot and is unobjectionable by any one in view of the fact that the diabetic foot complications is treated by the super subspecialist diabetic foot surgeon.

The Amit Jain's Institute of Diabetic Foot and Wound Care, a dedicated named wing in Brindhaavan Areion hospital at Bangalore, works on this new model. The directorate group of doctors of this hospital, based on authors training, focused and innovative work and vision played an instrumental role in establishing this model in their hospital since 2016.

In this monodisciplinary model/ one boss model, the diabetic foot surgeon manages the diabetic foot patient under his wing in toto. Patients are treated, admitted, operated, discharged along with regular dressings at outpatient basis and serial follow-ups of foot problems is purely done by the specialist diabetic foot surgeon. There is of course a routine support from wound care assistant or the nurse in this model who are important supporting colleague.

The other specialist like cardiologist, nephrologists, intensivists, vascular surgeon, etc are only consulted on 'as and when' need basis when the treating surgeon encounters a complex situation requiring other cross consultation and not on a routine. This model is indeed opposite to multidisciplinary team model wherein a bunch of different specialists daily visits the patients in opd/wards or during rounds. The multidisciplinary concepts are highly expensive, impractical in developing countries and who is the boss versus wrong boss for the

condition along with arguments in management of patients are quite common in multidisciplinary teams.

Role shifting – The role shifting in 'diabetic foot surgeon boss model' happens when other conditions predominates which the diabetic foot surgeon does not handle.

For example, if the patients develop a cardiac event, he is shifted to care of cardiologist or if a patient requires a vascular bypass procedure, he is shifted to a vascular surgeon for bypass procedure or if patient requires intensive care/ ventilator support, he is shifted under intensive care team, so on and so forth. Once the crisis is dealt with, the patient is continued to be cared for his foot by the diabetic foot surgeon.

There are multiple advantages of this model. The biggest advantage is the cost effectiveness, especially in developing and under developed countries where cost plays a crucial role in patient management and many a times a deciding factor on further treatment unlike west where cost is not a major issue.

The second advantage of this model is that it is free from disputes. When there are too many specialists dealing in a multidisciplinary team model, major disputes and professional disagreements and fights are known to happen in practice but they often are not revealed or discussed in such multidisciplinary model whereas in a mono-disciplinary model or the one boss specialist model, it is less likely to arise.

The third advantage of this model is it can effectively function at primary level, secondary level and also at tertiary/ higher level. The fourth advantage of this model is that different physician from different zones of the city/district can refer their patients for diabetic foot management and once the problem is treated, the patients are reverted back to the treating physician.

In this way, the fear of physician losing his patient in a major hospital to another physician is allayed. This can happen at hospital where there is no such model. The fifth advantage of this model is that the surgeon can extend his ability of treat other wounds too that can occur in diabetics. The sixth advantage is a better bonding with the patient since there is one to one regular interaction between patient and surgeon. Too many surgeons can disrupt this bonding in countries like India where the faith of patient on doctor is still high.

This model also benefits in-hospital doctors who want to manage or visit their patient while diabetic foot is being treated.

In his earlier days, the author attempted to have extended skills in form of getting trained in vascular bypass procedure, free flaps, endovascular procedure, etc. But later abandoned the idea of extended skills half way as it was difficult and prolonged with other specialist not willing to teach or train. Also, such skills functions at tertiary care hospital and not at primary care or secondary level hospitals. The cost of training was an issue. It was also seen the author study that role of different surgical specialist was diminishing with improved care and presence of a diabetic foot surgeon.[12] This monodisciplinary/solo boss model is authors dream model where a diabetic foot surgeon heads the diabetic foot wing.

These models are an attempt to standardize and improvise diabetic foot practice around the world through the Amit Jain's system of practice for diabetic foot which today is considered to be a modern diabetic foot surgery.[16-21]

CONCLUSION

Various different models have been proposed in western literature ranging from combination of endocrinology, vascular surgery, and plastic surgery along with podiatry. Each of these models have merits and demerits.

However, many of these models cannot be applicable in other countries and continents in view of it being expensive and also not acceptable due to different education/ training pattern and legal rules. These models are interpreted differently in different zones based on level of expertise of podiatrist.

The Amit Jain's model's are new novel attempt for diabetic foot which can be considered by many in future based on zones and type of practice in countries. The common entity in these entire models is a qualified diabetic foot surgeon at postdoctoral level which renders these entire models as standard model's as there is a right surgeon for the right disease.

However, the Amit Jain's dream model / solo boss model for diabetic foot' where the diabetic foot surgeon heads the ddivision/clinic/department/institute is undisputed, undeniable and unobjectionably the best model that can be followed in countries where diabetic foot surgeons are the emerging super subspecialist after their surgical qualification.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

REFERENCES

1. Batista F, Augusto Magalhães A, Gamba M, Nery C, Cardoso C. Ten years of a multidisciplinary diabetic foot team approach in Sao Paulo, Brazil. Diabetic foot and ankle. 2010;1(1):5203.
2. Singh S, Pai DR, Yuhhui C. Diabetic foot ulcer–diagnosis and management. Clin Res Foot Ankle. 2013;1(3):120.
3. Somayaji R, Elliott JA, Persaud R. The impact of team based interprofessional comprehensive

assessments on the diagnosis and management of diabetic foot ulcers: a retrospective cohort study. PloS One. 2017;12(9):e0185251.
4. Pupp GR, Scholl D. Evaluating and defining the team approach to limb salvage. Podiatry Today. 2010;23(10):18-22.
5. Sumpio BE, Armstrong DG, Lavery LA, Andros G. The role of interdisciplinary team approach in the anagement of the diabetic foot. J Vasc Surg. 2010;51:1504-6.
6. Korzon-Burakowska A, Dziemidok P. Diabetic foot- the need for comprehensive multidisciplinary approach. Ann Agric Environ Med. 2011;18(2):314-7.
7. Acker KV. Employing interdisciplinary team working to improve patient outcomes in diabetic foot ulceration: our experience. EWMAJ. 2012;1292):31-5.
8. Nather A. Team approach for diabetic foot problems. Malaysian Orthopedic J. 2007;1(2):3-6.
9. Rogers LC, Andros G, Caporusso J. Toe and flow: essential components and structure of the amputation prevention team. J Vas Surg. 2010;52(3):23s-7s.
10. Bharara M, Scimeca Cl, Fisher T. How to form a diabetic limb salvage team. Podiatry Today. 2010;23(6):64-8.
11. Clarke EAM, Tsubane M. The role of the podiatrist in managing the diabetic foot ulcer. Wound Healing Southern Africa. 2008;19(1):40-2.
12. Jain AKC, Viswanath S. Diabetic foot management in India: a 3-year audit from tertiary care centre. IJMSCI. 2016;3(110):2379-83.
13. Hatch DC, Armstrong DG. The multi-disciplinary team approach to diabetic foot. Podiatry Today. 2016;29(60):16-21.
14. Jain AKC, Kumar A, Mangalanandan, Kumar H. A decade of experience in managing diabetic foot at Amrita, India's largest diabetic limb salvage centre. J Diab Foot Comp. 2013;5(1):15-7.
15. Mucheria VN. Prevalence and risk factors of peripheral vascular disease in diabetic foot lesions. IJSS. 2016;3(11):32-6.
16. Jain AKC, Viswanath S. Distribution and analysis of diabetic foot. OA Case Rep. 2013;2(21):117.
17. Kalaivani V. Evaluation of diabetic foot complication according to Amit Jain's classification. JCDR. 2014;8(12):7-9.
18. Jain AKC. Amit Jain's system of practice for diabetic foot: the new religion in diabetic foot field. Int Surg J. 2018;5:368-72.
19. Singh M, Sahu A. Analyzing diabetic foot complication according to modern comprehensive Amit Jain classification from Indian subcontinent in a government care setting. IJCMAAS. 2017;13(3):125-30.
20. Jain AKC, Viswanath S. Studying major amputation in a developing country using Amit Jain's typing and scoring system for diabetic foot complications time for standardization of diabetic foot practice. Int Surg J. 2015;2(1):26-30.
21. Jain AKC, Viswanath S. Analysis of stump complications following major amputation in diabetic foot complications using Amit Jain's Principle and Practice for Diabetic Foot. Sch J App Med Sci. 2016;4(3E):986-9.

Cite this article as: Jain AKC. Amit Jain's new models for diabetic foot. Int Surg J 2018;5:3789-94.